ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

AUGUST 1957

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An Industry Report on...

▶Maintenance

Arizona copper pits keep close tabs on upkeep and repair of trucks. Scheduled maintenance is paying off in economy and efficiency . . . Bearing failure is a high cost item, but it can be avoided by some careful sleuthing

▶Metallurgy

Silver Bell raises molybdenite recovery . . . Australian process separates zirconium and hafnium . . . Inverted bosh increases capacity in nonferrous blast furnaces

▶Mining Methods

Latest step in the South Africans' campaign to speed shaft sinking in gold mines . . . Tungsten producers offer a guide to costs and methods for the small pit operator

▶and More

American Cyanamid's pebble phosphate plant in Florida . . . How to choose the right valve for the job . . . Pacific Isle, a postwar baby grows in Mesabi iron . . . Radium Hill uranium.

Easier way to select efficient pumps

for handling ABRASIVES, CORROSIVES

There isn't a table of numbers in this 16-page book. Instead, simple nomographs give you quicker means of determining the data with which to follow an exemplified formula for selecting your proper type and size of pump. A tear-out data sheet provides opportunity to obtain refinements of the solution by drawing on the vast pump experience of A-S-H engineers.

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The "41" will handle scraper loads up to 9900 pounds

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Rugged design and construction, holds expensive downtime to an absolute minimum

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New features of the "41" are designed to minimize operator fatigue and promote maximum safety of operation.

You can't ask for more convincing approval than this: A large company, already using a number of Ingersoll-Rand "41" Scraper Hoists, opened a new property. They promptly ordered twenty new hoists of the same type. Their reasons: complete dependability, minimum maintenance . . .

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8-533

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ENGINEERING AND MINING JOURNAL

91st YEAR OF PUBLICATION

AUGUST 1957

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B.F.Goodrich report:

Rubber turns a mountain inside out

B. F. Goodrich improvements in rubber brought extra savings

Problem: This is part of a 7-mile-long tunnel that will carry billions of gallons of water to a power plant. In digging the tunnel, they've practically turned a mountain inside out.

As fast as dirt and rocks (some of them boulders weighing 3000 pounds each) are blasted out, they're dumped on a rubber belt and carried away. But the smashing blows of 1½ ton rocks were pounding conveyor belts to death. Some split in two; others had their covers ripped off.

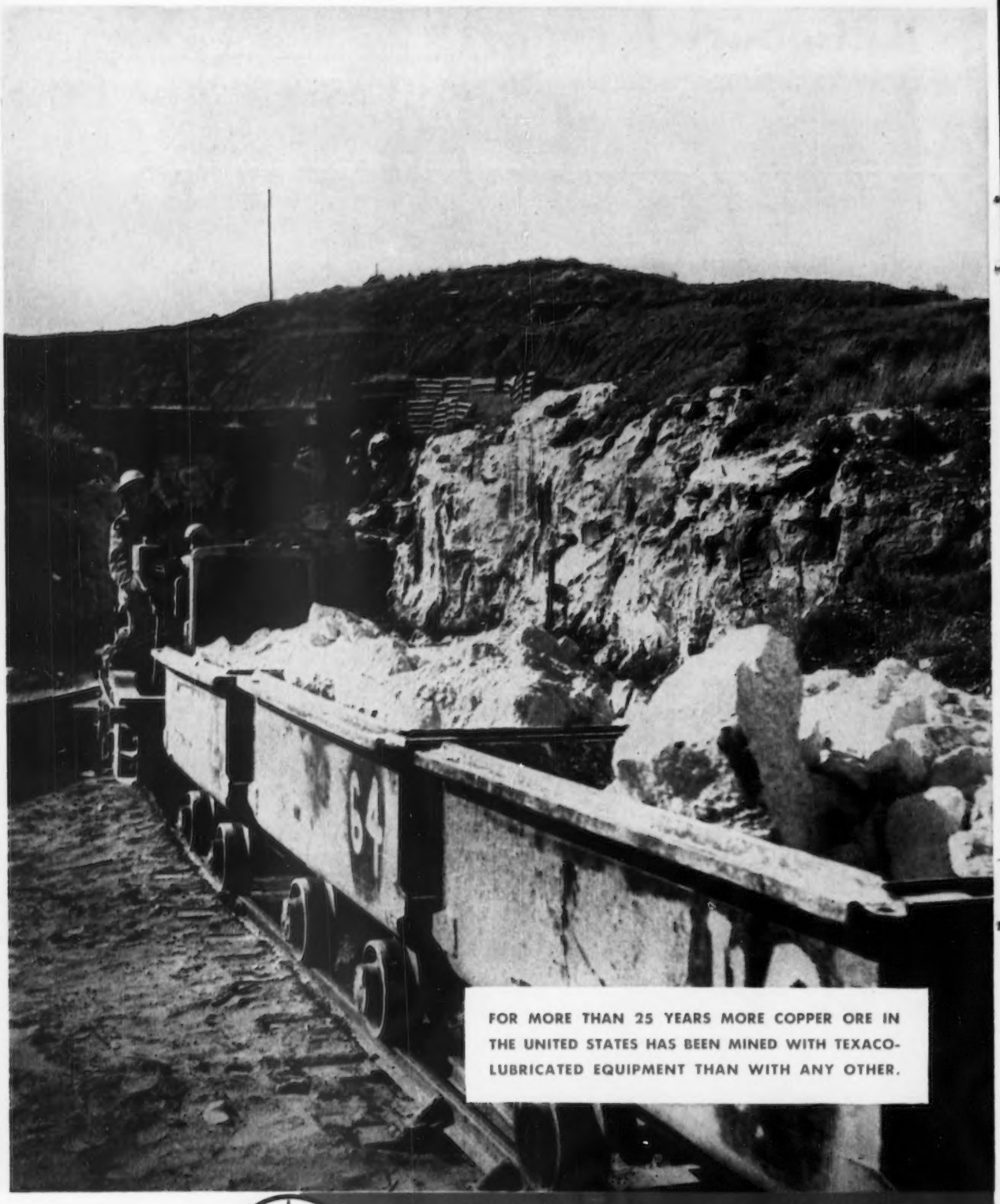
What was done: B.F.Goodrich engineers were asked to develop a belt that could stand the abuse. They started with the B.F.Goodrich cord belt, so called because it has cords running lengthwise, buried in rubber. To this they added several layers of Nyfil fabric, which gives extra strength to the belt without making it heavy and bulky. Special rubber compounds were used for the cover to stand the cutting and gouging of the rock.

Savings: The B.F.Goodrich belt was put to work here. It stood the banging, crashing better than any belt previously used. It lasted longer, carried more tons. B.F.Goodrich belts have now carried two-thirds of all the rock hauled out of here.

Where to buy: Your B.F.Goodrich distributor has full information on the conveyor belt described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-128. Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS


64
FOR MORE THAN 25 YEARS MORE COPPER ORE IN THE UNITED STATES HAS BEEN MINED WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER.
TEXACO
TEXACO

How long can you keep equipment operating "like new"?

Let's face it! Keeping equipment operating like new depends among others on three very important items: (1) lubricating with the proper lubricants, (2) using the proper quantities, and (3) lubricating on schedule.

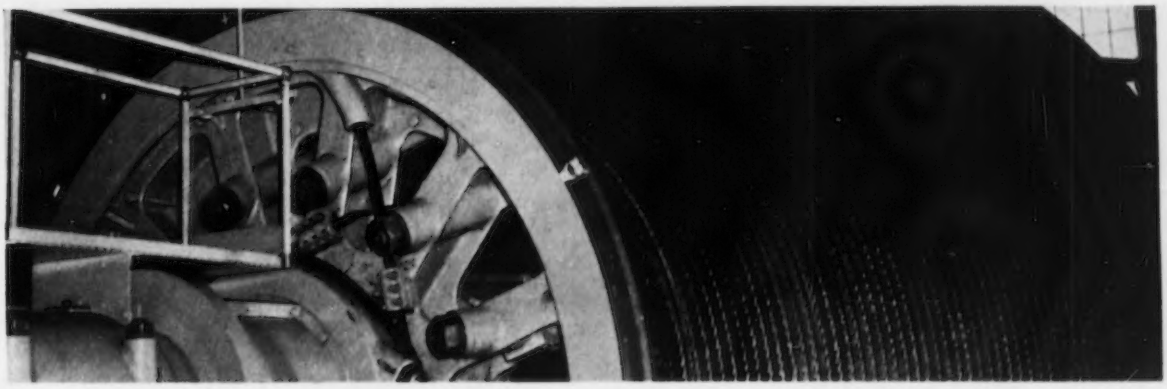
To provide the proper lubricants, Texaco regularly works with the manufacturers and operators of all types of mining equipment.

Texaco Olympian Grease, for example, was developed for mine car wheel bearings to assure fast, easy starts—every time. It resists stiffening at winter temperatures—resists thinning out in heat. It stays in the bearings under adverse conditions, giving long-lasting protection against dirt, moisture and wear.

Furthermore, *Texaco Olympian Grease* resists oxidation, doesn't separate in storage. And it is available in three consistencies to fill every plain, cavity or antifriction bearing requirement.

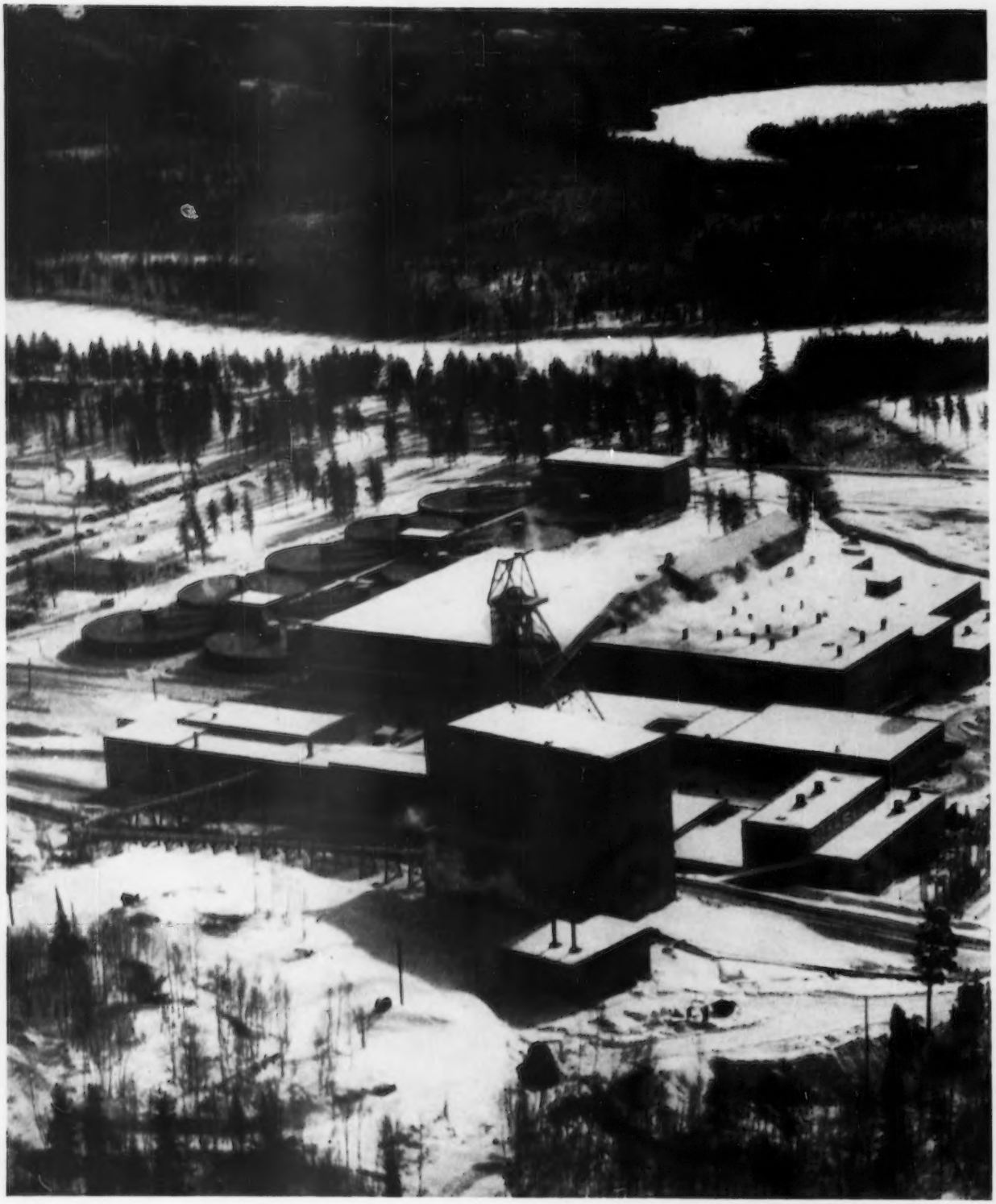
Lubricant qualities like these can keep both new and old equipment operating efficiently longer. Ask your Texaco Lubrication Engineer to help you choose the best lubricants for your equipment. Ask him, too, to help you draw up a lubrication schedule that will include data on the quantities needed. Call the nearest of more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO CRATER was developed to keep wire rope strong longer. It protects the metal strands against wear and rust, surrounds and preserves the core. It also sticks to the teeth of open gears, protecting them against shock loads and heavy service. Or use *Texaco Crater X Fluid*—it goes on as a liquid, stays on like regular Crater.

Lubricants and Fuels
FOR THE MINING INDUSTRY



COUNTER-CURRENT DECANTATION

at ALGOM URANIUM

One of the largest yellow cake producers in North America, Algom Uranium Mines Ltd. has been operating their Quirke Mill at full capacity since early in 1957. A unique feature at this mill is the installation of ten Dorr Thickeners in the CCD washing circuit. The units are each 100 feet in diameter, constructed of stainless steel; and despite the severe climate, are located out of doors.

Situated in the Blind River Area of Ontario, the Quirke Mill uses Dorr-Oliver equipment and methods at many steps in the flowsheet. The steam visible in the photo is being vented through the roof from the completely enclosed Dorr-Oliver Uranium Leach Agitators installed in the mill building. Dorr HX Classifiers are also installed at Quirke along with a number of D-O pumps of various sizes and designs.

For more information on Dorr-Oliver's complete line of equipment for metallurgical processing, write for a copy of Bulletin No. 2200. Dorr-Oliver Incorporated, Stamford, Conn.

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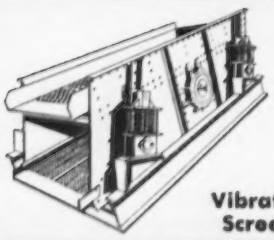
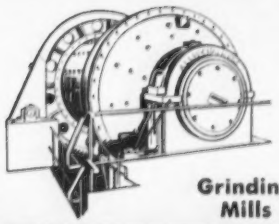
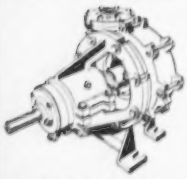


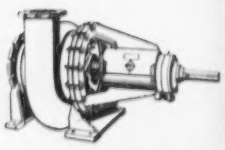
Vibrating Screens



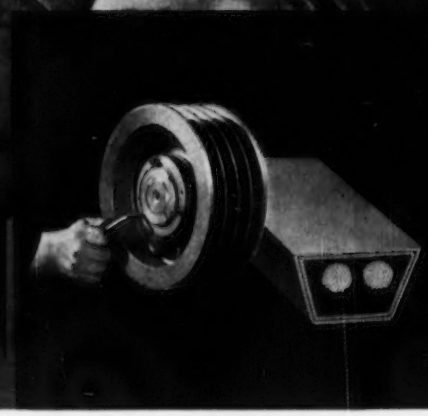
Grinding Mills



Rubber-Lined Pumps



Solids Handling Pumps



Send for Bulletin 07R7995

"Work index" formula enables you to evaluate crushing and grinding operations . . . compare efficiency of plants, circuits, machines. This handy reference offers only scientific method of determining the right machine and required horsepower.

Gyratory Crushers

Emergency unloading, wear compensation, setting changer are flip-of-the-switch operations on Allis-Chalmers crushers equipped with *Hydroset* mechanism. Even the world's largest crusher utilizes the convenience and economy of the *Hydroset* mechanism.

Texrope Drives

For maximum efficiency in transmitting power between motor and machine, Allis-Chalmers offers a complete line of *Texrope* V-belt drive equipment . . . variable speed sheaves, fast adjusting motor bases, *Texrope* belts with 33% more gripping strength.

GET ALL THE FACTS. See your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-

One Responsibility

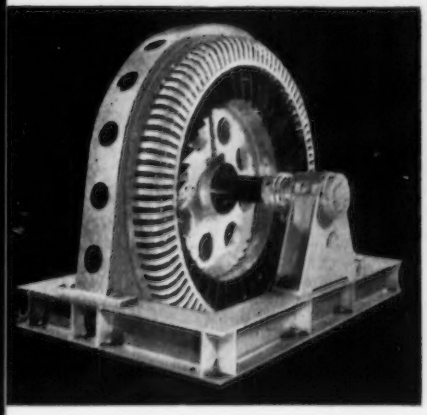
PROFIT PACKAGE

Processing Machinery, Pumps, Motors and Power Equipment Engineered to Work Together . . . Designed to HELP YOU Increase Production and Cut Costs

CRUSHERS, grinding mills, screens, pumps, generators, switchgear, transformers, motors, drives, control — *Allis-Chalmers builds them all.* And out of this unequalled diversity has come the unique ability to "coordineer" machinery and equipment for a complete process—yes, even for an entire plant.

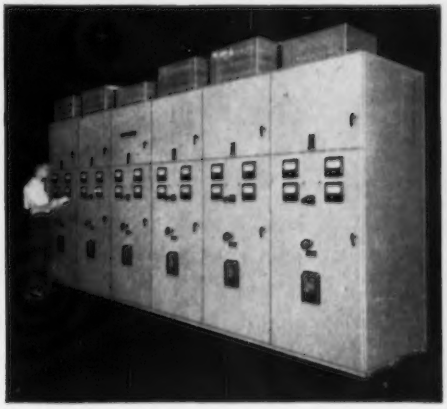
How it Works

Allis-Chalmers maintains separate departments staffed by research, design, manufacturing and application specialists for each product. "Coordineering" results from an interdepartmental exchange of ideas and technical information correlated in *one department specializing in mining applications.* In this department components are matched to meet the requirements of your job. New as well as existing equipment in your plant is integrated into a smooth, productive, profitable operation. And, of course, Allis-Chalmers assumes undivided responsibility for efficient performance.



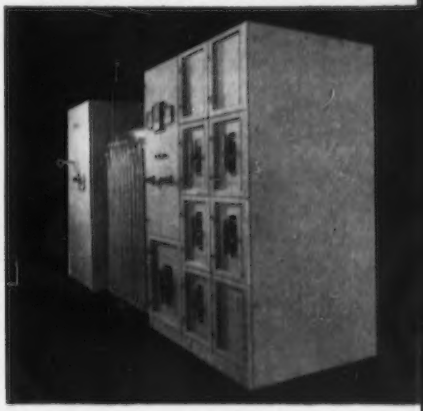
Motors

Allis-Chalmers builds a complete line of motors from ½ horsepower and up. Applying the "work index" formula, Allis-Chalmers engineers can help you determine the required power input and apply the right size motor needed for maximum efficiency and economy.



Control

Starter illustrated features circuit designed to cut crusher downtime. Overload protection is provided by two sets of thermal overload relays. One set operates on slight overload to sound warning. Second set stops motor when temperature reaches the danger point.



Unit Substations

Designed for maximum flexibility. Additions or replacements to basic centralized unit can be made conveniently at any time. Strategically located, unit substations bring high voltages near load centers — cut cable costs, minimize line loss, save space, provide complete protection.

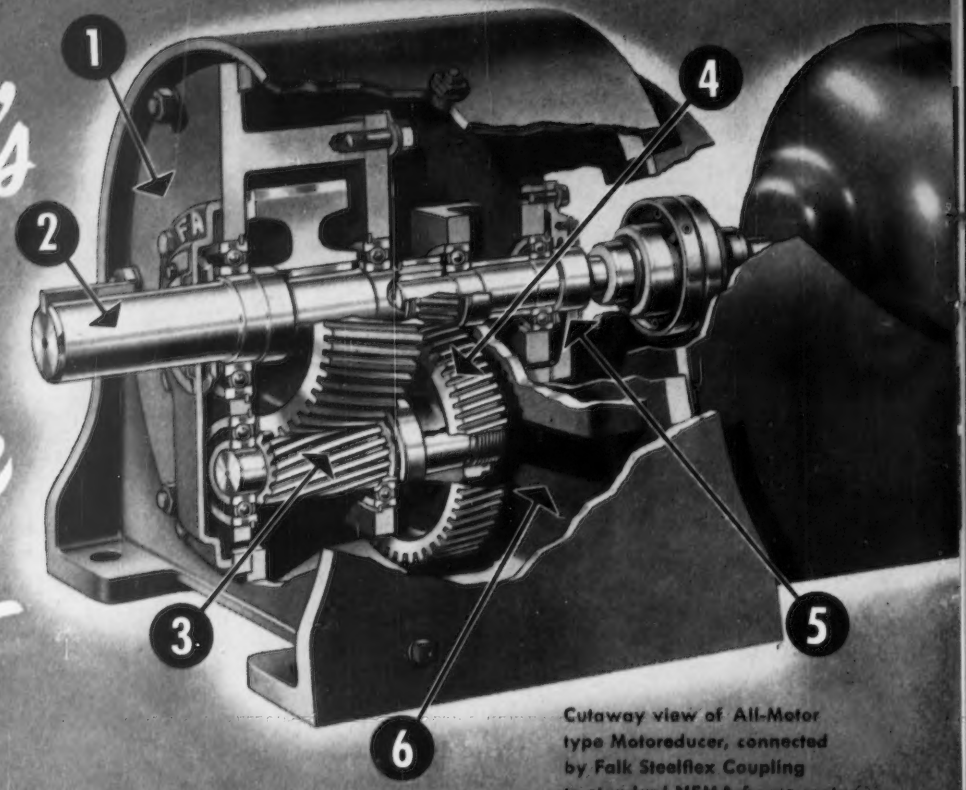
CHALMERS

A-C ALLIS-CHALMERS

Hydroset and Texrope are Allis-Chalmers trademarks.

A-5406

Here's the inside story—



Cutaway view of All-Motor type Motoreducer, connected by Falk Steelflex Coupling to standard NEMA frame motor

WHY Falk Motoreducers give better service—have longer life

Here is the "inside story" behind the all-steel All-Motor type FALK Motoreducer's universal reputation as a gear drive unmatched in quality, efficiency, dependability, ease of maintenance and long life. These "In-built" factors are—

1 **ALL-STEEL HOUSINGS.** Rugged, strong, rigid...all parts are manufactured from heavy steel plate, formed and welded in the Falk Weld Shop.

2 **LARGE OVERHUNG LOAD CAPACITY.** Large shafts, oversize bearings...rigid mountings with wide bearing spans to handle maximum applied loads.

3 **PRECISION GEARING.** Heat-treated alloy steel gearing, precision cut and shaved after heat treatment to eliminate distortion. Quiet, crown-shaved pinions.

4 **EXTRA-CAPACITY GEARING.** Special extra-capacity gear-tooth form with larger contact area gives greater strength, higher load-carrying capacity.

5 **SEALED HOUSINGS.** Splashproof, dustproof, oil-tight construction. Dual closures and one-way vents keep oil in, dust and moisture out.

6 **POSITIVE LUBRICATION.** Large sump capacity...oiltight construction assures clean lubricant...revolving elements lubricated by direct dip.

When you buy or specify the All-Motor type FALK Motoreducer, you get all these—plus the tremendous advantage of full interchangeability of motors. Switch motors as desired—use any make, style or type of standard foot-mounted motor within the unit's AGMA rating—with a minimum of difficulty or "down time."

Available in sizes up to 75 hp—*with or without motor*—from convenient factory, field or distributor stocks, from coast to coast. **Write for Bulletin 3100.**

60,000 HOURS WITHOUT A FAILURE!

Sixty thousand hours is a lot of hours—but the FALK Motoreducer in the unretouched photo above has served that long without failure or need of repair.

This 3 hp unit is one of over 60 FALK Motoreducers in daily service in an Eastern plant of a large milling company, whose president says, in part:

"One of the main advantages of FALK Motoreducers is their adaptability to any motor. Reducers and motors can be easily interchanged.... Our service records confirm the wisdom of our choice of FALK equipment as our standard."

FALK ...a good name in industry

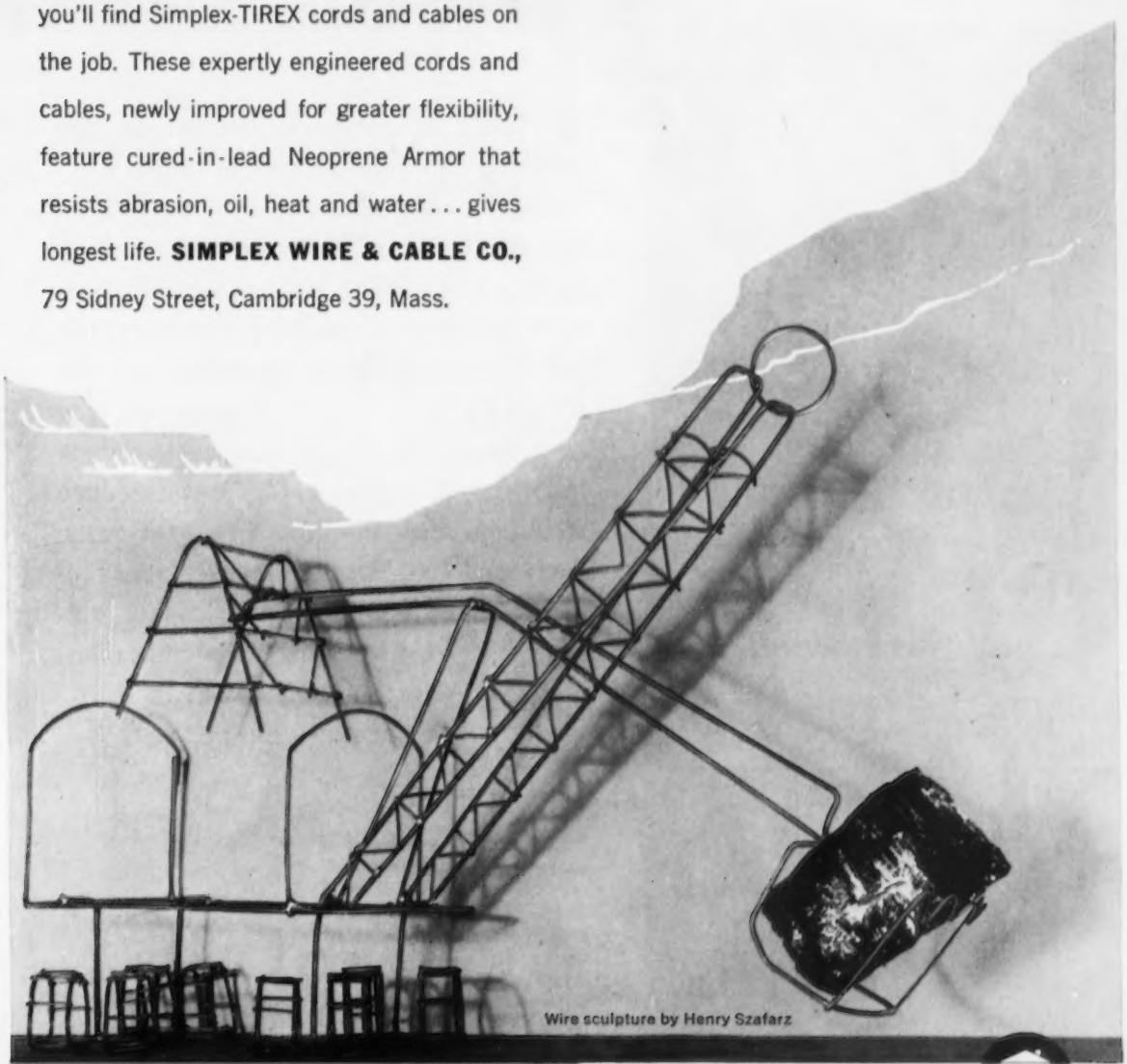
THE FALK CORPORATION, MILWAUKEE, WISCONSIN

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

Every Bite is a Payload

The effective use of power equipment is the very essence of successful mining operations. And everywhere that power is used in mines, you'll find Simplex-TIREX cords and cables on the job. These expertly engineered cords and cables, newly improved for greater flexibility, feature cured-in-lead Neoprene Armor that resists abrasion, oil, heat and water... gives longest life. **SIMPLEX WIRE & CABLE CO.,** 79 Sidney Street, Cambridge 39, Mass.



Wire sculpture by Henry Szafarz

Shovel Cable Type SH-D

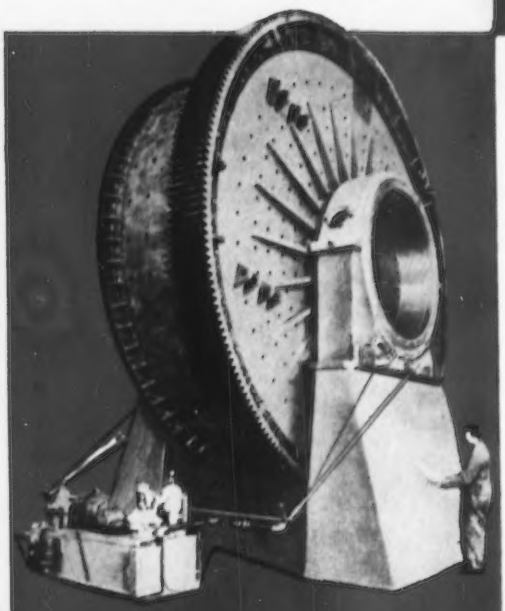
LOVE BETTER ELECTRICALLY

Simplex

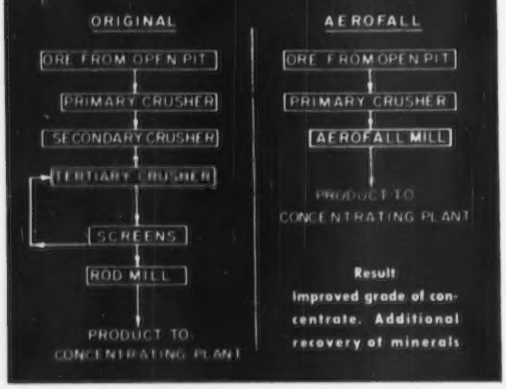
TIREX

Cut your CRUSHING AND GRINDING COSTS *with the.....*

AEROFALL MILL



IRON ORE FLOWSHEET COMPARING ORIGINAL PLANT WITH AEROFALL SYSTEM



● Here's a compact, continuous dry crushing and grinding system that is electronically controlled and fully automatic. The AEROFALL MILL combines crushing and grinding in a single operation, thus several stages of crushing which precede conventional grinding equipment are unnecessary . . . . With this circuit you save on initial installation cost, reduce labor costs, lower power costs, reduce steel consumption and cut reagent costs. Increased metallurgical recoveries are indicated on lead-zinc, and copper sulphides and on iron and uranium oxides.

Write for Bulletin 55A
for complete details.

Shown is a plan view of a unique patented arrangement of six 17 foot AEROFALL MILLS grouped around a common ore feed bin at a large Asbestos property in Quebec Province. Designed for a capacity of 5,000 tons per day, this arrangement eliminates complicated and costly feeding apparatus.

ARRANGEMENT OF 6-17FT. MILLS

AEROFALL MILLS, INC.

1025 WEST THIRD AVE., COLUMBUS 8, OHIO, U.S.A.

AEROFALL MILLS, LTD., 129 ADELAIDE ST., W., TORONTO, CANADA

AFRICAN AEROFALL (PTY) LTD., MARITIME HOUSE, JOHANNESBURG, S. AFRICA

What They Say About The AEROFALL

"It should be standard throughout the industry." . . . . .
. . . . . *Metallurgist, Uranium Mining Co.*

"The Aerofall grind produces a different type of product. It cannot be judged by the product from other equipment." . . . . .
. . . . . *General Manager, Uranium Mining Co.*

"Our laboratory work utilizing heavy solutions, etc., has shown without question that we obtained better liberation in the Aerofall Mill than in wet ball mills, even at a finer grind in the ball mills."
. . . . *Metallurgist, Non Metallic Mining Co.*

"We certainly studied the effects of oxidation in the Aerofall on our sulphide ore. Here are the figures: Aerofall product % Oxide Copper 0.02; wet grinding 0.06%."
. . . . . *Consulting Metallurgist*

"We made about $180,000. additional recovery last year in the Aerofall section compared to our conventional system."
. . . . . *Manager, Metal Mining Company*

"The Aerofall is a dropkick mill. It drops the charge—then kicks hell out of it!"
. . . . . *Plant Supt., Aerofall Plant Metal Mining Company*

"We can CUT your COSTS!
We may HELP your METALLURGY!"

AEROFALL MILLS INCORPORATED

Roof Bolting at the Face Minimizes Danger of Rock Falls

When you install Bethlehem headed roof bolts at the face, using a predetermined pattern, the mine roof becomes safer, less likely to fall. This is because the roof bolts lock themselves in drilled holes, anchoring the strata into a thick, self-supporting beam.

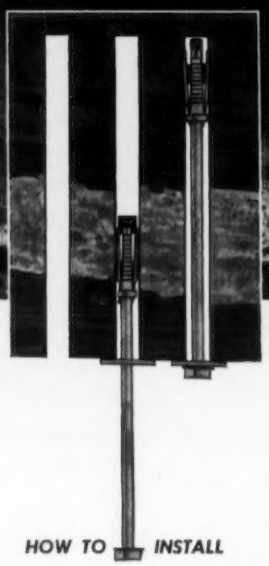
With such a roof bolting installation, wider openings and clearances are possible. And because there are no bulky supports, mechanized equipment can be maneuvered easily, even right up to the face. Besides, there's no fire hazard involved.

CHOOSE FROM THREE TYPES

The Bethlehem headed roof bolt is furnished in these types:

1. ¾-in. carbon steel; typical breaking load 24,000 lb.
2. ⅝-in. high-strength; typical breaking load 24,000 lb.
3. ⅞-in. high-strength; typical breaking load 45,000 lb.

If you would like to have additional information about the use of Bethlehem headed roof bolts, or the 1-in., wedge-type slotted roof bolt, all you need do is drop a line to the nearest Bethlehem sales office.



HOW TO INSTALL

Assembly, consisting of square-head bolt, square roof plate, malleable-iron shell and steel plug, is inserted in drilled hole.

Bolt is tightened, drawing down plug, and expanding leaves of shell.

Roof plate provides additional support. Steel tie may be used instead.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

The Low-Down on Low-Bowl Scrapers

A wide, low bowl is important in a scraper, but it takes more than just low-bowl design to give you performance with the best profit factor.

That's why Allis-Chalmers combines this with other equally important features to give you the most efficient scrapers available.

CHECK THIS PROFIT-BUILDING COMBINATION:

1.

Low, wide-bowl design for fast, heaped loading.

2.

Curved bowl bottom and offset cutting edge for faster, easier penetration and live, boiling loads that fill every corner of bowl.

3.

Patented apron-ejector linkage combines high apron lift with positive, forward forced ejection—permits either quick, complete dump or smooth, even spreading.

Your Allis-Chalmers dealer will be glad to discuss these and many other profitable advantages with you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *Engineering in Action*

NORDBERG MACHINERY
. . . used by leading
TACONITE producers

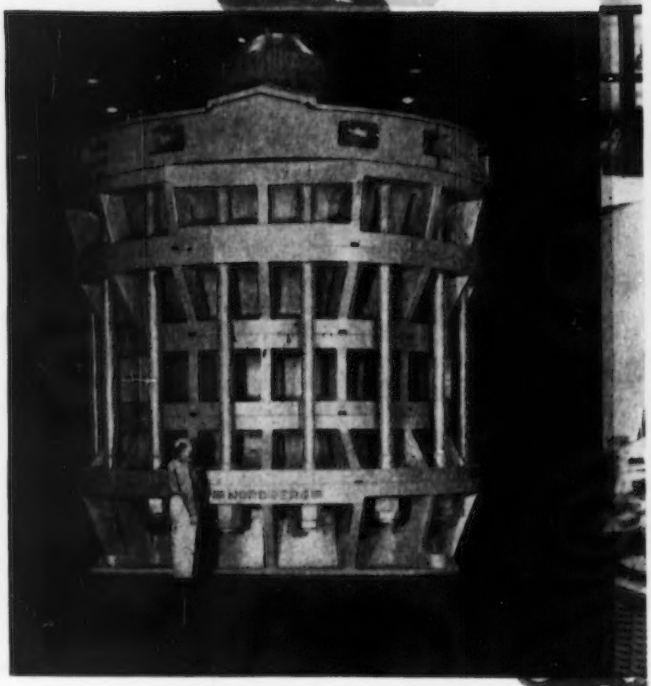
To provide adequate iron ore reserves for today's increased steel production, the large-scale beneficiation of Taconite ore has become imperative.

Long used in the economical production of Taconite concentrates in the Arctic region of Norway, Nordberg Machinery is now serving the huge Taconite operations in northern Minnesota . . . where a new era in U.S. iron ore production is now underway.

The selection of Nordberg Machinery for the processing of the extremely hard Taconite ore again follows the trend of the mining fraternity to rely on this heavy duty machinery for its proven ability to reduce ores and minerals at low per ton cost.

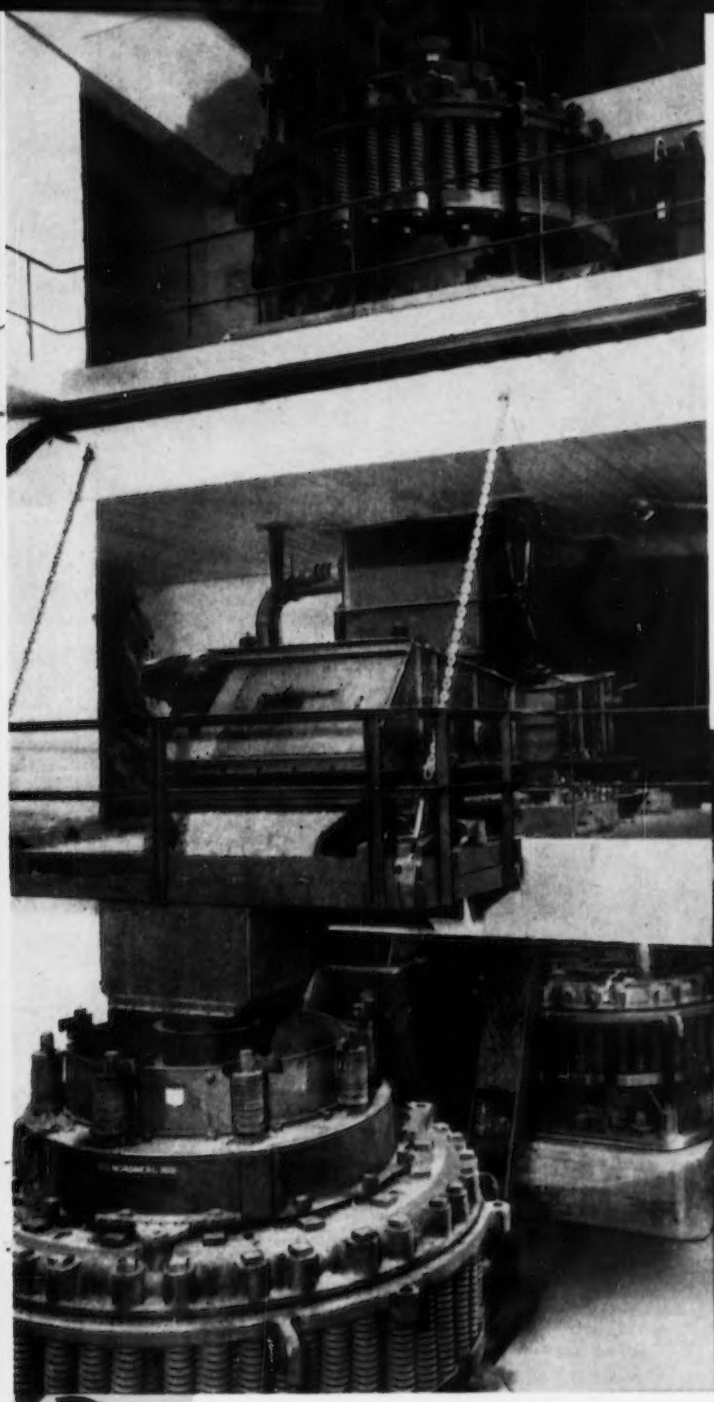
Nordberg Machinery now in use by leading Taconite producers includes Symons® Primary Gyratory Crushers, Symons Cone Crushers, Nordberg Rod and Ball Mills, and Symons Rod Deck Screens.

While *your* crushing and processing problems may not involve Taconite, you may be sure that Nordberg machinery is the logical choice for practically any other ore and mineral processing operation where big tonnages at low cost are required.

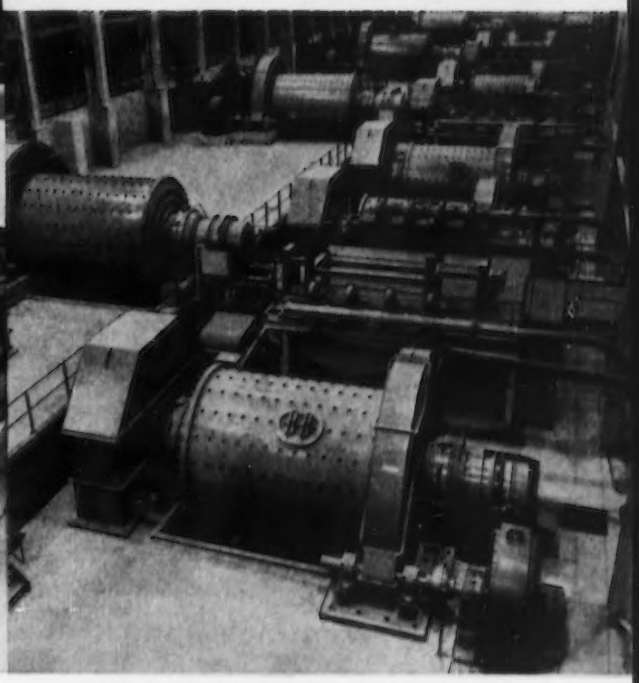


This Symons Primary Gyratory Crusher has a feed opening of 54" and capacity of 2000 or more tons per hour of hard, abrasive Taconite ore. Symons Gyratories are built in sizes up to 72" feed openings, with capacities of over 3500 tons per hour.

NORDBERG MFG. CO., MILWAUKEE,



Typical arrangement of Symons Cone Crushers and Symons Vibrating Rod Deck Screens installed for secondary and tertiary crushing, and screening of Taconite ore. Cone Crushers of this type are built in sizes up to 7′ diameter, with capacities to over 900 tons per hour.



Battery of four Nordberg 10½′ x 16′ Rod Mills and eight Nordberg 10½′ x 14′ Ball Mills installed in a large Taconite concentrating plant. Other Nordberg Grinding Mills are built in sizes from 6′ to 13′ diameter and up to 50′ in length in Rod, Ball, Pebble, Tube and Compartment types.

© 1957, Nordberg Mfg. Co.

WISCONSIN

M257

SYMONS . . . A REGISTERED NORDBERG TRADEMARK
KNOWN THROUGHOUT THE WORLD

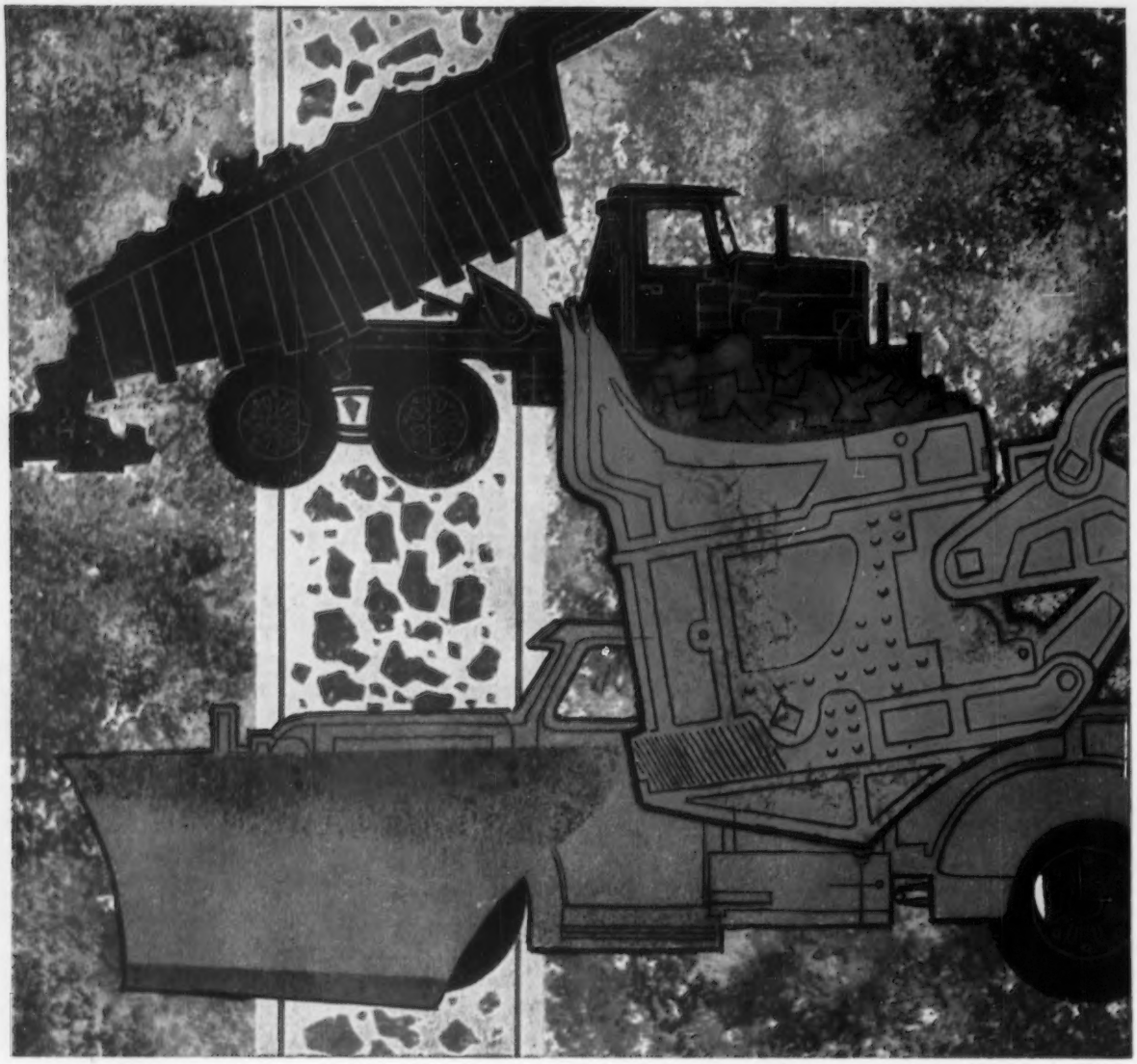
NORDBERG MACHINERY

NORDBERG

Gathering Symons Screens Nordberg

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • ST. LOUIS • DULUTH • WASHINGTON
TORONTO • MEXICO, D. F. • LONDON • GENEVA • JOHANNESBURG



JALLOY special alloy steel

resists impact and abrasion in toughest applications

Heat treated Jalloy steels wear as much as 20 times longer than mild steels under rigorous impact and abrasive conditions. By using Jalloy you can cut maintenance costs drastically. Increased product life reduces downtime and lowers your labor costs.

Jalloy steels are available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalloy can be purchased in three grades to meet specific use requirements: Grade 1, where formability is important; Grade 3, capable of being heat treated to excellent physical properties for good resistance to abrasion or wear; Grade 7, where high hardness with good ductility or wear resistance is desirable.

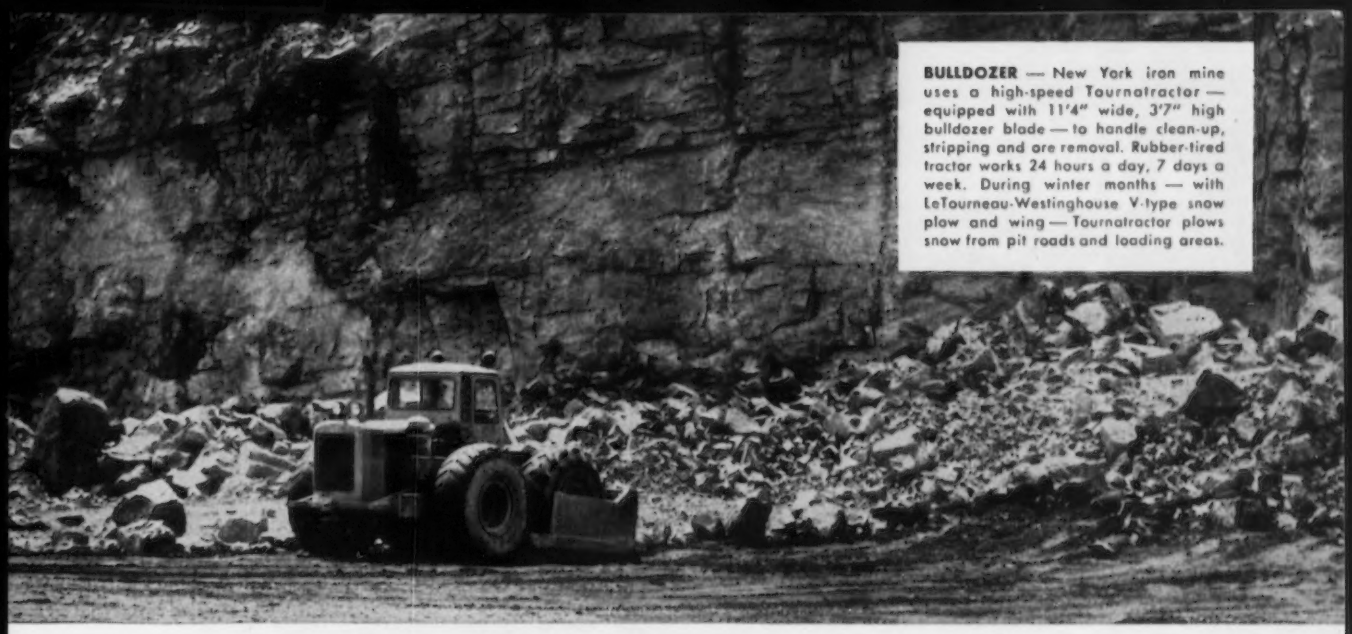
Your local distributor can supply you with latest information on these Jalloy grades, or you can write to Jones & Laughlin Steel Corporation, Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

JL STEEL

Jones & Laughlin

...a great name in steel

176



BULLDOZER — New York iron mine uses a high-speed Tournatractor — equipped with 11'4" wide, 3'7" high bulldozer blade — to handle clean-up, stripping and ore removal. Rubber-tired tractor works 24 hours a day, 7 days a week. During winter months — with LeTourneau-Westinghouse V-type snow plow and wing — Tournatractor plows snow from pit roads and loading areas.

Are you using 2 tractors where 1 would do?

SCRAPERS — At a southeastern open-pit phosphate mine, owners use 2 Tournatractor-drawn scraper teams for constructing levees around waste ponds. Optional LeTourneau-Westinghouse double-drum PCU efficiently operates any cable operated equipment.

TOWS EQUIPMENT — At a large midwest silica mine, Tournatractor also cuts downtime for air-compressors and other heavy equipment by moving them from one location to another fast. Tractor's big, low-pressure tires cross RR tracks, pavement, etc., without damage.

ANGLEDOZER® — Leading western copper mine uses Tournatractor — equipped with Angledozer blade — for clean-up of railroad tracks and loading area around widely-scattered shovels. 14'10" wide, 3'3½" high Angledozer blade can be angled 20° right or left.

SWITCHTRACTOR* — A southern uranium mine's Tournatractor—equipped with type "E" railroad coupler — spots ore cars in-between dozing chores. This versatile rubber-tired tractor can move 5 loaded or 18 empty cars up a 1 per cent grade.

This versatile rubber-tired LeTourneau-Westinghouse Tournatractor® can handle your scattered pit clean-up and road-maintenance jobs twice as fast as slower-moving crawlers. Here's why:

"Go-anywhere" mobility

High-speed Tournatractor *drives everywhere under its own power* — is never more than a few minutes away from its next assignment in your pit area. Rubber-tired tractor travels across pit floor, over railroad tracks, air-drill hoses, pavement, without damage.

Handles wide variety of jobs

With a L-W attachment to fit almost any work assignment, Tournatractor keeps busy productively all year-around. Use it for spotting rail cars . . . for fast push-loading or towing service . . . for heavy dozing to improve or construct haul-roads, detours or drainage. You'll find a single Tournatractor handles more work over a wider area — without excessive tractor moving expense — than 2 or more crawler-tractors! Why use 2 where 1 would do?

See Tournatractor in action

Why not let us arrange for a demonstration? See for yourself how LeTourneau-Westinghouse Tournatractor can lower costs and increase production at your pit. No obligation.

*Trademark CT-1495-M-1

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

WHERE QUALITY IS A HABIT

A TUNGSTEN CARBIDE INSERT BIT

"drilled to destruction without need of resharpening"

patents applied for

Lower first cost... Low cost per foot of hole drilled with

LIDDICOAT

the new bit you have heard and read about

Forged for Toughness

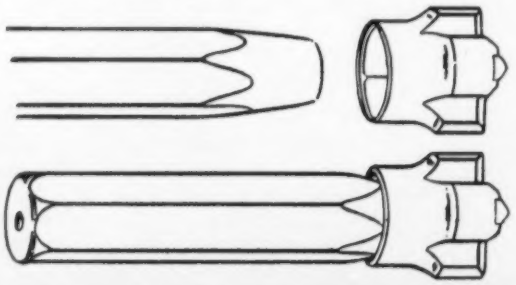
The Liddicoat Tee Cee bit body is produced entirely by forging. By a patented and exclusive manufacturing process, the hot alloy steel is subjected to tremendous pressure which extrudes the steel in the desired shape. This method preserves the important grain of the steel, flow lines being compressed rather than cut across as is usual in forgings of this type. The retention of the unbroken grain and the compression of the steel provides Liddicoat bits with an unusually strong tough body.

Longer Life from Interesting New Insert

In examining the Liddicoat Tee Cee bit, you will note the shallow tungsten carbide insert (patents applied for). It is the design of this insert that provides the unusual performance of the Tee Cee bit. Experience with the conventional multi-use insert bit indicates that the bit will usually dull at a given footage, the distance of course, depending on the type of rock. The dulling point of the multi-use carbide bit is not to be considered as the life of the Liddicoat single-use Tee Cee bit, for experience proves that the Liddicoat "used to destruction" Tee Cee bit drills far beyond the average dulling point of the multi-use Carbide bit.

Taper Socket—No Threads —Fast, Firm Attachment

The type TS Tee Cee Liddicoat (no resharpening) bit has a completely new taper socket connection. Within the socket of the bit is a brass shim. The socket, which is completely forged, is tapered to correspond to the taper placed on the drill rod. The connection assures an absolute attachment to the rod, and yet permits easy removal. The taper socket has been especially designed for the single pass Tee Cee bit.

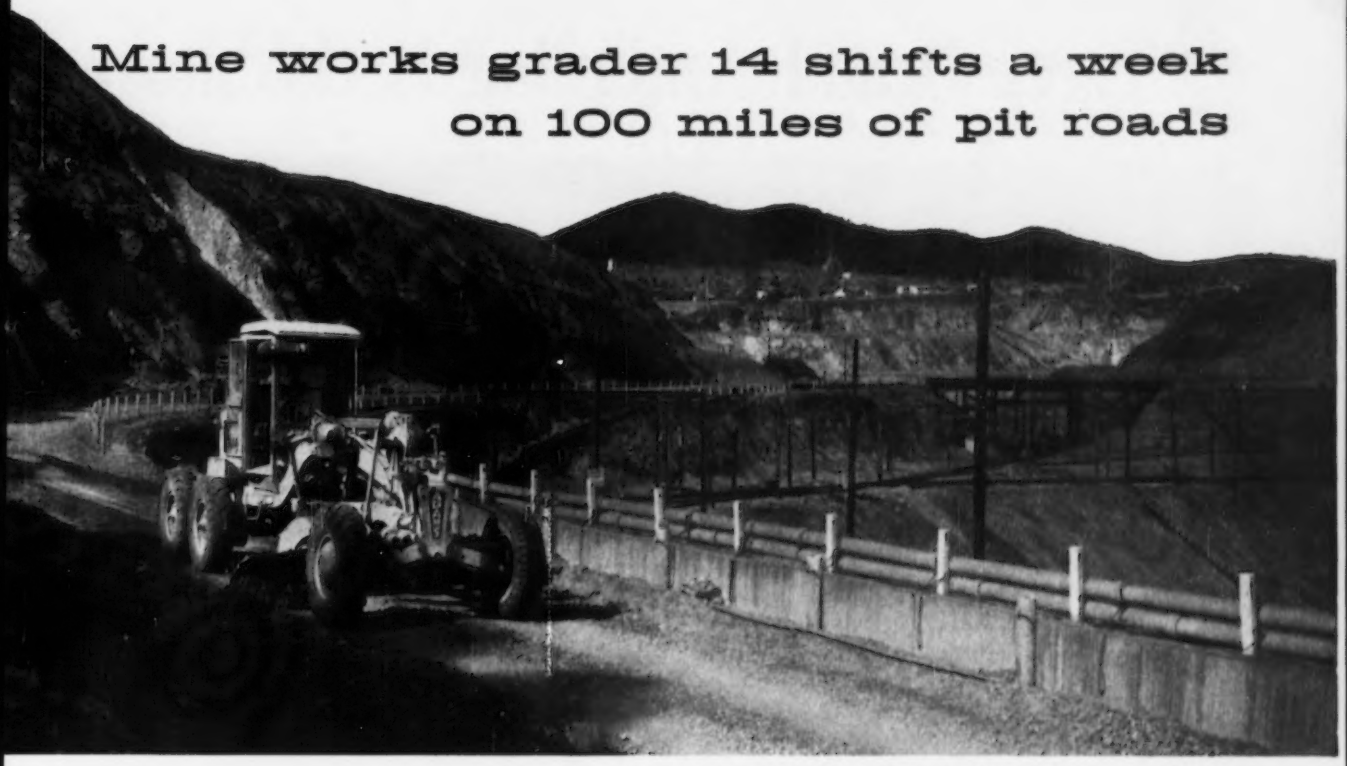


WESTERN

Rock Bit Manufacturing Company

552 West 7th South • Salt Lake City 4 Utah

Mine works grader 14 shifts a week on 100 miles of pit roads



Fast-moving Adams 550 grader does lion's share of maintaining more than 100 miles of bench roads at big copper mine. This 123 hp unit grades, ditches, backslopes, does scattered clean-up work.

Two shifts a day, 7 days a week is the rugged schedule of work for a 550 Adams* motor grader at a big southwestern copper mine. 4 to 6 operators take turns manning this heavy-duty unit as it hustles about . . . maintaining more than 100 miles of steep, winding mine roads.

Adams handles many jobs

Roads at the mine coil around the huge open pit, along wide benches 15′ to 20′ high. Surfaced with crushed stone, roads vary in width from one to six lanes. Usually working in 2nd gear, the Adams 550 grades fast and accurately. It ditches, backslopes, does all-around work — such as filling ruts, leveling ridges, and cleaning up debris fallen from banks or spilled from haul units.

Tough assignments, long hours, are right down Adams' alley. Built to withstand severe stress and strain, these graders can take it!

Structurally, the "550" has a big, all-steel box frame for lasting strength and rigidity. It is continuous-welded to take stresses as a unit — from bolster plate to boxed-in rear end. Streamlined, front to rear, this Adams frame has no sharp bends, no cross-section welds, no bolted or riveted joints to break. Front axle is made of welded heavy bar and plate . . . with yokes, kingpins, and spindles of forged, heat-treated steel. This rugged frame foundation, outstanding in the industry, is a basic factor in Adams' accuracy of control, low power loss, and speed as well as its dependability and economy of performance.

Power-wise, the two engines from which you can choose have been job-proven in more heavy-duty construction and road maintenance use around the world, than any other engines available anywhere. Mechanically, all gears and shafts run on anti-friction bearings, and all clutches slide on ball bearings. The 8-speed transmission is the finest ever built for use in a motor grader.

Adams lasts longer, works harder

Net result is a motor grader that lasts longer, works harder . . . with less upkeep. From the utility 220 model, with 60 hp . . . through 80, 115, 123, and 150 hp sizes . . . to the big torque-converter POWER-*Flow* 660, with 190 hp . . . Adams gives you more grader for your money.

Look into the Adams line of heavy-duty motor graders. Your LeTourneau-Westinghouse Distributor has all the facts and will be pleased to arrange a working demonstration of the model that fits your needs best.

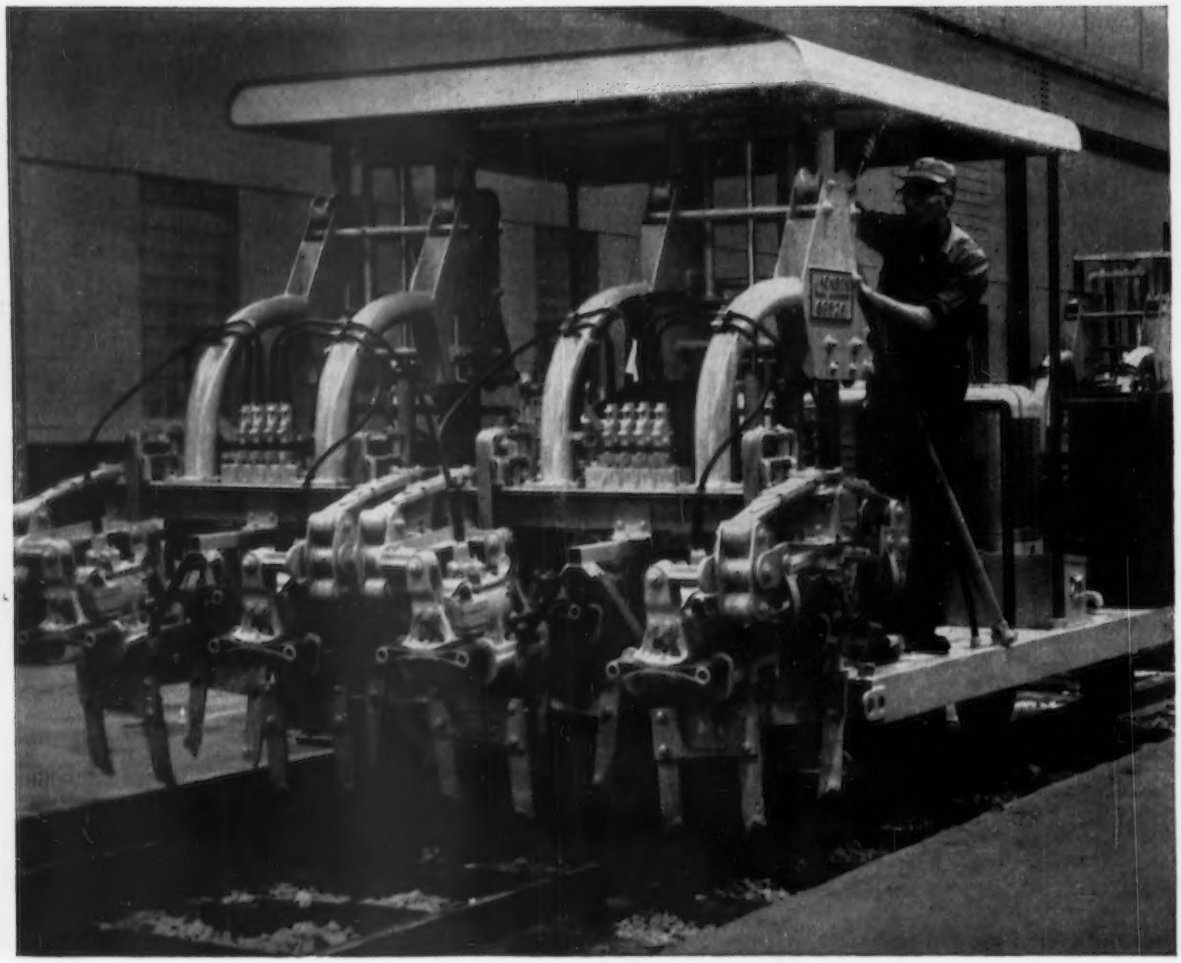
Twisting uphill grading is done faster with Adams 550, because it offers several full-power speeds for each kind of work. With 15-speed transmission available, operator can always select gear that will get the most work done at the lowest cost. *Trademark G-1485-M-1

LeTourneau-**WESTINGHOUSE** Company, PEORIA, ILLINOIS

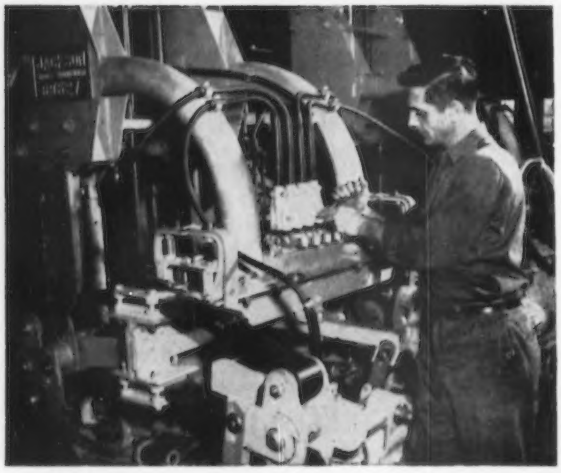
A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

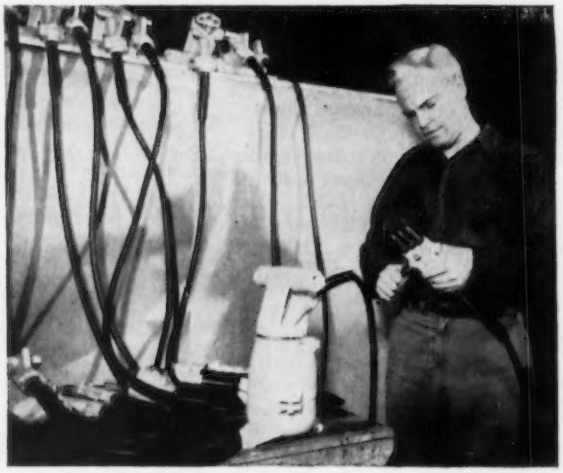
"Tiger Brand Amerclad is the most



The completely self-contained Jackson Track Maintainer.



Tightening connectors. Machine delivers 4500, 2-ton blows per minute.



Assembling leads. Each vibrator delivers ¾ ton blow.

durable cable we've ever used"

says **ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan**

MANY years ago, the executives at Electric Tamper & Equipment Co. found out that when railroads order a piece of machinery, they expect it to last a long time—without breakdowns. Since then, Electric Tamper has won a high place in industry by producing a line of the hardest-working, *toughest* track maintenance machines on the market.

Leader of the line is the Jackson Track Maintainer, used for tamping ties. It has 8 powerful vibratory motors that drive 8 tamping assemblies. Each motor is powered with Tiger Brand Amerclad cable. The vibration and flexing (which are very severe) caused previous cable to crack until the jackets actually peeled away from the conductors. So they asked American Steel & Wire for advice.

Tiger Brand Amerclad was the solution. Finely stranded conductors soak up vibration and allow greater flexibility than ever before. The tough, well-cured jackets are impervious to oil, grease and the burning sun.

In the company's own words, "Tiger Brand cable is certainly superior to anything we have ever seen for this class of service. Its complete dependability under all service conditions has definitely helped us to maintain our good reputation in the field."

Do you want a *better* electrical cable—engineered for your equipment? Just call your American Steel & Wire representative.

The Jackson Multiple Compactor for consolidation of granular soil.

Hand Vibrospade. Cable usually drags on the ground.

Small compactor. See why they need durable cable?

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TIGER BRAND ELECTRICAL WIRE & CABLE

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- shovel & dredge cable
- paper & lead cable
- varnished cambric cable
- interlocked armor cable
- special purpose wire & cable
- aerial, underground and submarine cable

USS

UNITED STATES STEEL

In Utah . . . and the World Over
BUCYRUS-ERIE ELECTRIC SHOVELS HELP KEEP HAULING UNITS ON THE GO!

This Bucyrus-Erie 110-B with 4½-cu. yd. dipper is loading out waste rock at a vast copper mining project in Utah.

Dependability is a big reason why Bucyrus-Erie electric shovels keep haul units on the go the world over. The heavy-duty construction of these shovels lets them take over the tough work . . . and keep working day after day, year after year. The exclusive two-section boom, tubular dipper handle and twin dual hoist combine to provide great strength, while reducing power-consuming deadweight. Strain on swing machinery is reduced . . . work cycles speeded.

And Bucyrus-Erie electric shovels are as productive as they are dependable. With the tubular dipper handle free to turn in the saddle block when digging strains fall heavier on one side of the dipper than the other, torsional strains in the handle itself are eliminated. The twin dual hoist ropes pull the dipper straight through the toughest banks. Let us tell you more about the proven dependability and big output of Bucyrus-Erie electric shovels. Write for full information.

143L57C

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

see how ore dressing methods have been improved . . .

Early ore processors used primitive tools such as these to separate their golden treasure from worthless matter. Photo taken around 1850.

This modern beneficiation plant employs latest methods throughout all operations. Here Guartec is used as a depressant in flotation.

GUARTEC AMAZING NEW DEPRESSANT MINIMIZES **INSOL** REPORTING

Today's big news in froth flotation is Guartec, a new hydrophillic colloid that makes it possible to recover high-grade concentrates from extremely lean ores—at a profit. When used as a depressant, low cost Guartec:

- minimizes insol reporting
- reduces collector cost
- increases recovery
- lowers tailing loss

Guartec is not choosey about its reagent partners either—works equally well with both cationic and anionic collectors. Other profitable uses are as settling agents and filtration aids.

GUARTEC depresses insols:

Barite	Dolomite
Bauxite	Greenalite
Bentonite	Gypsum
Chamosite	Hematite
Clays	
Hydrated Aluminum Silicates	
Kaolin	Meerschaum
Limestone	Montmorillonite
Limonite	Serpentine
Hydrated Aluminum Oxides	
Talcs	Phosphates

GUARTEC in action

Guartec will scour most gangue-coated values which otherwise escape collector action. In a base metal mill, tailings containing .57% copper and .92% zinc sulphides were retreated using 1.2 pounds of Guartec per ton to depress the insol. Recovery: 9 pounds of copper and 14 pounds of zinc per ton of tailings with 94% of the insol rejected—typical performance for low cost Guartec.

Guartec is a dry powder-like material which is added to water for application. It stores and handles easily, is packed in 100-pound multiwall, pliofilm lined paper bags. Samples are available on request.

Send for NEW **GUARTEC** *booklet!*

SPECIAL COMMODITIES DIVISION
GENERAL MILLS
Minneapolis 1, Minnesota

Please send new booklet describing profit-opportunities in ore dressing with amazing new Guartec.

Name_____

Position_____

Firm_____

Address_____

City_____ Zone____ State_____

SPECIAL COMMODITIES DIVISION
MINNEAPOLIS 1, MINNESOTA

General Mills

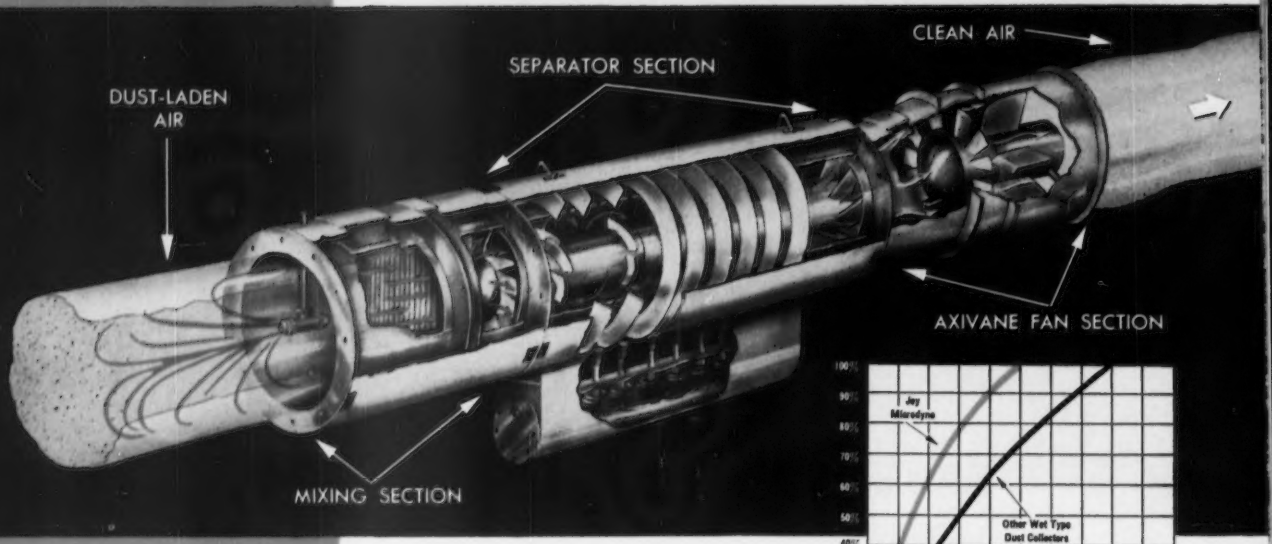
Another new and bigger Forward Control 'Jeep' Truck

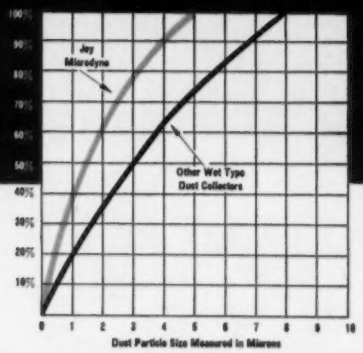
IT'S NEW!

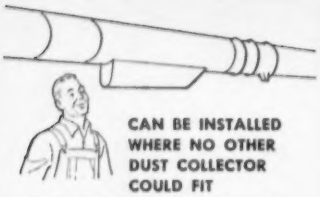
THE COMPACT, HIGH EFFICIENCY

JOY MICRODYNE

DUST COLLECTOR





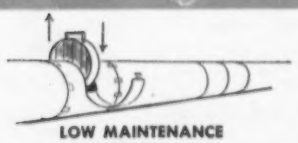


CAN BE INSTALLED WHERE NO OTHER DUST COLLECTOR COULD FIT

Fits into existing ductwork, often right at point of use.

CLEANS 2500 to 64000 CUBIC FEET EACH MINUTE

There is a Joy Microdyne model designed to meet the special conditions of the application.



LOW MAINTENANCE AND POWER COST

Self-cleaning impingement unit is easily removed. Power requirements are unusually low.

1/10 to 1/20

THE SIZE OF ANY OTHER DUST COLLECTOR

Here's a new, wet-type dust collector with an efficiency rating of over 99% down to 5 microns, yet so small and compact it fits where no other collector could. Your own maintenance crew can bolt it easily into existing ductwork, often right where dust originates. Air-borne dust particles, drawn into the mixer section by a Joy Axivane fan at the rear of the collector, are entrained by water after impact on an impingement element.

Dust encased in water droplets passing to the second section are directed by centrifugal force to the wall of the cylinder, thence to a sump below, where the slurry can be pumped or drained away. Low power and water requirements result in unusually low operating cost. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** *In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

LOWEST COST PER CFM FOR THESE TYPICAL APPLICATIONS

- Metal scale in steel plants and foundries
- Air-borne sand in foundries
- Cleaning air contaminated in mining operations
- Coal dust at screening and drop-off points
- Wherever crushing or grinding operations occur
- Recovery in Uranium mining
- Explosive dust in grain elevators or flour mills
- Dust from granite quarrying and finishing
- Removal of sulfuric acid mist
- Removal of abrasive dusts like taconite

Write for FREE Bulletin JB-616 or FREE Dust Test

Get this descriptive bulletin or let a Joy Engineer take dust samples at your job site for plant analysis.

ADDRESS DEPT. 184-4

JOY MANUFACTURING COMPANY

EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY

WSW 1-6710-184

Bigger cargo area!

Another new and bigger Forward Control 'Jeep' Truck—the FC-170—puts a big 9-foot platform stake body on a wheelbase only 103½-inches long. This 7,000-pound GVW workhorse has room for 49 bales of hay, 35 bags of cement, or 60 bushel baskets. And the bed is only 35-inches from the ground for back-saving ease of loading!

"Go-anywhere" action!

The new 'Jeep' FC-170 Truck sets a new standard for "big-load" maneuverability. It delivers payloads of up to 3500-pounds to areas ordinary vehicles can't reach. The spacious Safety-View cab puts you in a "Forward Control" position—lets you maneuver on or off the road with greater command of any driving situation!

Tough-job traction!

The extra traction of FC-170 4-wheel drive, and its wide 63-inch tread, take you "almost anywhere" with ground-gripping stability. It shifts easily into conventional 2-wheel drive for highway travel. The high-torque Hurricane 6-226 engine delivers real working power at low cost. It's ready for your bigger, tougher jobs!

New 'Jeep' 4-Wheel-Drive Forward Control FC-170

Willys...world's largest manufacturers of 4-Wheel-Drive vehicles

...other members of the famous 'Jeep' family:

Forward Control 'Jeep' FC-150

Universal 'Jeep'

'Jeep' Utility Wagon

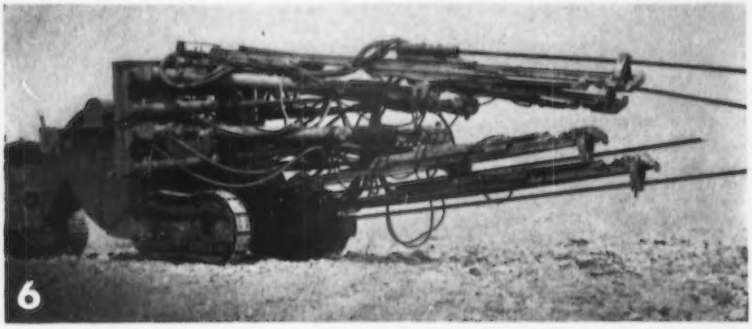
See 'Jeep' vehicles at your Willys dealer

W-2510C

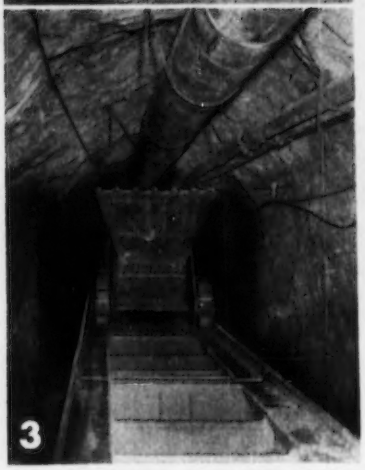
How Simple Gismo® Equipment cuts manpower in development and production work...

MINIMUM AMOUNT of equipment in stopes automatically reduces manpower to the minimum. Gismo unit consists of 4-drill jumbo and S-D Gismo Self-Loading mucking transport. Two men operate 4-drill jumbo; one man operates Gismo in the mucking operation.

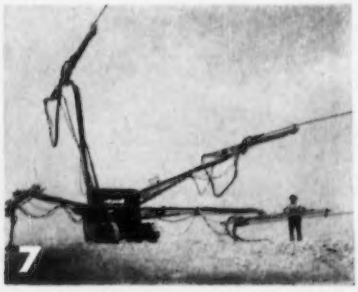
IN PRODUCTION or stope-work Gismo transports its loads and dumps directly into storage bin or ore pass as shown above, or ramping over present haulage equipment if haulage is now in ore bed. Same S-D Automatic Cars used for development work are used for haulage transportation from ore passes to hoisting facilities.



SAME GISMO mucking power unit is used to move 4-drill jumbo to new stope face or in development heading. (See Photo 6 above.) During drilling cycle in stope-work the Gismo power unit is used with mucking transport. Note in Photo 7 at right the reach of the 4-drill jumbo.



IN DEVELOPMENT Gismo loads directly into S-D Automatic Cars. (See Photos 2 and 3 above.) Two men operate 4-drill jumbo; one man operates Gismo and one man operates locomotive in car haulage.



As in all mechanization programs, proper supervision and maintenance programs should be set up. You may obtain complete information by writing ***Sanford-Day Iron Works, Inc., Knoxville, Tenn.***

SANFORD-DAY

KNOXVILLE, TENNESSEE

ON THE go

by J. Hall Carpenter

SOME OF THE WORLD'S LARGEST HIGH INTENSITY MAGNETIC SEPARATORS are now being manufactured by Carpco. At maximum flux, these huge separators create 176,000 magnetic lines of force for every square inch of separating surface. This gives a total of 57,600,000 lines of force available for separation in a 16-rotor machine. These new high intensity induced roll magnetic separators will be the highest intensity units ever produced and, at the same time, the most flexible and completely automatic separators in service. Feed rates from 8,000 to 32,000 pounds per hour can be handled by the 16-rotor machine. A pre-publication flyer describing these new machines is available on request.

CARPCO HONG KONG LIMITED has recently been incorporated to once again provide better engineering and equipment supply service by Carpco. The Hong Kong office will act as home base for Carpco engineers to give rapid service to the Far East. Equipment will soon be available through Hong Kong so that prompt delivery can be made with a minimum of currency exchange problems.

HOW BEARING MAINTENANCE CAN BE MINIMIZED IN MINERAL SEPARATION PLANTS has been demonstrated by a recent standardized program at Carpco. Now 29 models of machinery, including high tension and magnetic separators, dryers, elevators, belt conveyors and other types of equipment, have been standardized to *one* bearing. Every bearing in these Carpco equipped plants is in its own dust tight enclosure and even grease fittings have been eliminated.

CARPCO AUSTRALASIA, PTY. LTD., our branch in Brisbane, Australia, has been actively increasing their engineering staff. Pat Sheahan, one of the new members of the Carpco group, is now in Jacksonville for a three-months training period. We welcome Pat, a well known mining engineer with a diversified engineering background, to our group. Previous to joining Carpco, he was head of the Mining and Metallurgical Department, Ballarat School of Mines.

Carpco

CARPCO RESEARCH AND ENGINEERING * CARPCO MANUFACTURING, INC.
CARPCO CONSTRUCTION CORPORATION * CARPCO EXPORT CORPORATION
JACKSONVILLE, FLORIDA, U. S. A.

KOEHRING WORK CAPACITY *in action . . .*

Here are some figures that will interest you:

KOEHRING MODEL	SIZE DIPPER	LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load.)	
205 CRAWLER	½-Yd.	20,000 lbs.	at 10-ft. radius
205 ON RUBBER	½-Yd.	30,000 lbs. 14,600 lbs.	at 12-ft. radius at 20-ft. radius
305 CRAWLER	¾-Yd.	30,000 lbs.	at 12-ft. radius
305 ON RUBBER	¾-Yd.	30,000 lbs. 15,800 lbs.	at 10-ft. radius at 30-ft. radius
405 CRAWLER	1-Yd.	40,000 lbs.	at 12-ft. radius
445 ON RUBBER	(Crane only)	90,000 lbs. 40,000 lbs.	at 15 ft. radius at 25-ft. radius
605 CRAWLER	1½-Yds.	72,300 lbs.	at 12-ft. radius
805 CRAWLER	2-Yds.	104,200 lbs.	at 12-ft. radius
T305 CRAWLER	3-Yds.	190,000 lbs.	at 12-ft. radius

Want more information? See Koehring distributor.

Solid footing on soft banks — Loading gravel off the bottom of a water-filled pit, Koehring 405 dragline (above) holds firmly to the edge of soft, loose banks. Stability of its extra-long, extra-wide crawlers shows up to good advantage in conditions like this. Extra stability means extra work-capacity, too. The heavy-duty 405 handles 1 to 1½ cubic-yard dragline or clamshell buckets on a wide work-radius — boom lengths range from 40 to 90 feet. Butt-connected boom is solid, safe. Inserts are easily changed. Check the 405's other work capacities (in chart) — then have Koehring distributor demonstrate what it will do on your lifting, loading, stripping, stockpiling.

Quarry rock — ¾-yard 305 loads out Lannon stone in a Mid-West quarry. It's a rugged rock shovel, with exceptional operating ease. Big 23-inch main-drum power clutch requires only 1/10th the lever-pull of a comparable-size manual clutch — yet, retains "feel" of load.

15-ton handyman — With its heavy lift capacity and high-speed mobility, Koehring 205 truck crane is a handy material-handling rig to have around. It unloads heavy equipment and supplies, installs machinery — converts to ½ to ¾-yd. clamshell or dragline, ½-yd. shovel, hoe.

Big stripper — Look at the work range of this big 1205 high-lift shovel. It digs up to a height of 42 ft.-10 in. at 45° boom angle — dumps at a height of 31 ft.-5 in. That's with a 3-yard dipper on 40-foot boom. *Need more reach?* It also takes a 2½-yard dipper on a 50-foot boom — has 51 ft.-4 in. cutting height, and 40 ft.-10 in. dumping height, at 45° angle! For heaviest digging, the standard 1205 has 3-yard dipper on 30-foot boom. On dragline or clamshell work, it handles 3 to 4-yard buckets on 60 to 170 feet of boom. *Want more facts?* See Koehring distributor for complete story on this big 1205. Call today.

KOEHRING DIVISION OF KOEHRING COMPANY, Milwaukee 16, Wis. 6761

MAX-WEAR ALLOY

makes parts like these last longer

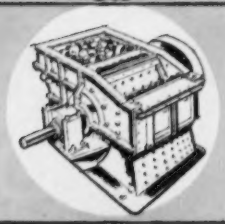
DREDGE BUCKET

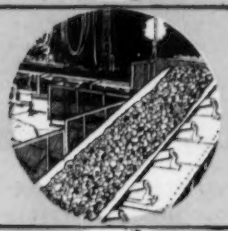
ROCK CRUSHER

CHUTE LINING

WEAR PLATE

GROUSER BARS





—keeps equipment on the job

Max-Wear Alloy Steel (13% manganese, 2% nickel) is *work hardening!* This means the more it's used the harder the surface becomes (up to 500/550 BHN). But only the surface hardens; the interior of the steel is unaffected. As a result, Max-Wear parts have truly wear-resistant surfaces *plus* high strength and toughness internally.

When you make parts like those shown with Crucible Max-Wear, you reduce downtime, cut repair and replacement costs. For Max-Wear resists repeated heavy impacts and abrasion—just what you need on jobs where equipment takes a bad beating.

Crucible Max-Wear is especially practical for repairs in the field. It can be formed cold or at *red heat*, and is easily shear or torch cut and welded. No annealing is necessary after these operations—a big advantage in the field.

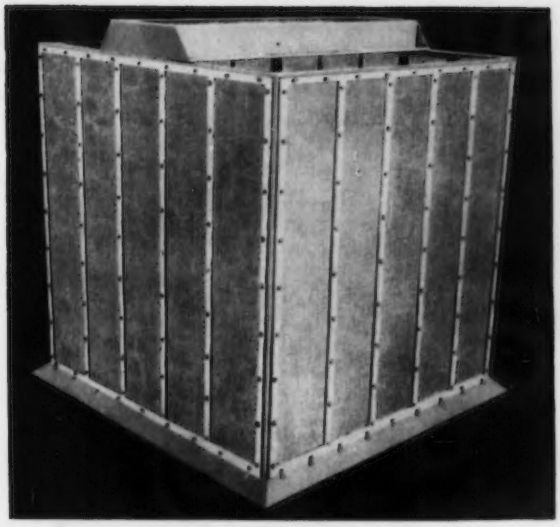
Max-Wear is now available in rounds, squares, plates and special grouser shapes. If you are looking for an easy-to-use alloy steel that will give you longer service under impact, wear and abrasion, try Crucible Max-Wear. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST

James W. Franklin



Resin-In-Pulp Basket (6)

Frame members and a 35-mesh screen covering five sides of this 48-in. square side basket are constructed from Carpenter Stainless No. 20 steel, designed to withstand the corrosive attack of dilute sulphuric acid, ammonium nitrate and chloride used in Anaconda Co.'s uranium operation.

Electronic Mapping Aid Cuts Survey Time (1)

Photographic Survey Corp. has acquired a tellurometer to replace conventional traverse and triangulation methods used to measure distances for map making. Device, developed by South African Council for Scientific & Industrial Research, consists of a master and remote station. Time required for microwave signals to travel from the master to the remote station is measured and translated into distance. The tellurometer weighs only 24 lb. Operating range is up to 50 miles and the unit will function day or night. Duplex radio-telephone permits instant voice contact between station operators.

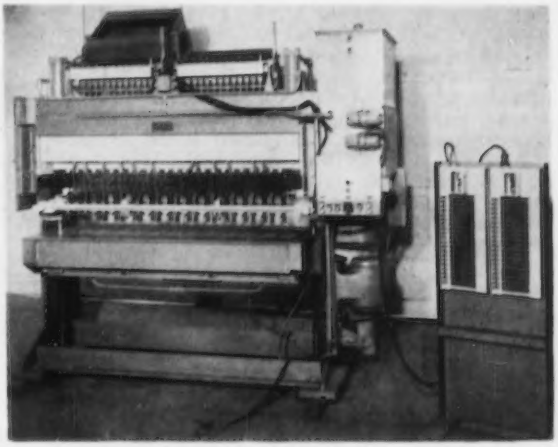
Battelle Process Granulates Molten Ferrosilicon (3)

Developed for Rhude Media Co., Battelle Institute process disintegrates molten ferrosilicon into a product with as much as 50% minus 65 mesh and up to 70% through 40 mesh. Particle size can be controlled, within limits, through control of molten metal and the high-velocity water jet used to scatter the molten ferrosilicon into rounded or generally spherical particles. Process is potentially useful for many metal grinding projects where controlled particle size is in demand.

Prepackaged Cold Pack Rations (4)

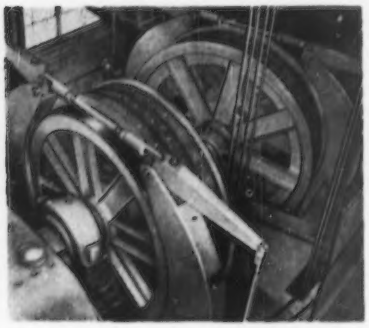
Called the Miner's Special, Bolton Farm Packing Co., Inc.'s field ration unit consists of whole meal biscuit, meat or fish spread, jam or marmalade, candy, bouillon or consomme, chewing gum, canned fruit, can opener, and plastic knife and spoon. Each package weighs 2 lb. The Miner's Special is packed 36 to a case. Food pack is a cold ration, containing no stove, Sterno or matches and will provide quick, nutritious on-the-spot meals. Shelf-life of Bolton's waterproofed packages is guaranteed at 12 months.

Continued on page 36. For more information on these items, use card opposite page 42.



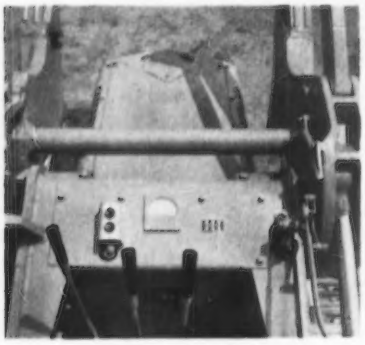
Heavy Duty Hydraulic Nailing Machine (5)

Capable of driving 24 nails through hard oak in a single stroke, Food Machinery & Chemical Corp.'s hydraulically operated nailer can be adjusted for driving nails in the 4- to 20-penny range. Selection of nailing design is done automatically through the electric control panel, and nailing sequence patterns also can be set up.



Koepe Hoists Cut Costs (7)

Aros Electric, Inc. says that the major advantages of the ASEA friction drive are lower installation and operating cost, lower rope wear and greater safety derived from multiple rope arrangement. Rope wear can be reduced through elimination of fleet angles, S-bends and cross-overs. Aros now has nine hoists on order for U. S. and Canadian mines.



Underground Caterpillar (17)

Recently delivered to U. S. Lime Corp., was a Caterpillar No. 955 Traxcavator equipped with 60-hp electric motor, rather than the normal diesel. The unit will be operated 600 ft underground, loading lime into railroad cars for delivery to the surface. Bucket is 1.1 cu yd. Motor is 1800 rpm, 440v U. S. Electric. Cable reel has 200 ft of 3-wire, ground, rubber-covered conductor. Tractor was assembled in the mine, according to Caterpillar Tractor Co.

Roof Bolt Drill Bit (11)

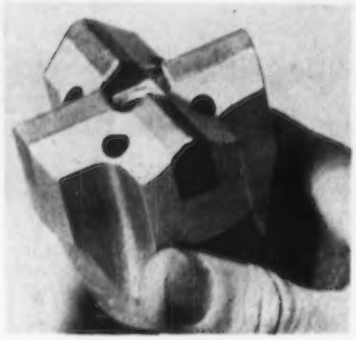
With a V-shaped design of the carbide insert, General Electric Co. has demonstrated that their Carboloy PTV roof bolt drill bit offers free drill action, simplified maintenance and maximum use of the carbide.

Truck-Mounted Rotary Drill (19)

Mobility and rapid set-up are two advantages of air-operated rotary drill developed by Scramm, Inc. for truck mounting. Unit will drill to 700 ft with 4½-in. drill pipe and to 1500 ft with 2⅞ in.

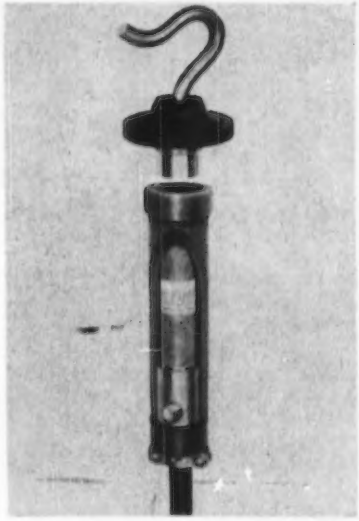
Down-the-Hole Well Drill (8)

Full-scale tests at Gulf Oil's research center indicate that Gulf's down-the-hole drill can double or even quadruple drilling speeds through the hardest rock. Drill consists of a reciprocating piston and cylinder powered by drilling mud circulated through the hole. The cylinder is approximately 19 ft long. Conventional roller bits are used.



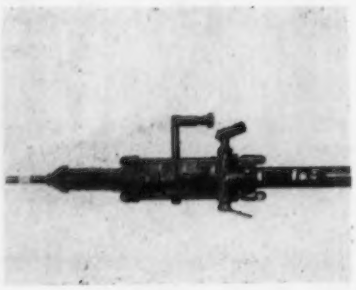
Detachable Bits (10)

Sandvik Coromant detachable bits incorporating tungsten carbide inserts are now available in the U. S. from Atlas Copco Eastern, Inc. Shown above is the 2½-in. dia bit with 1⅜-in. D. thread. Other bits are available from 1⅜ to 4½-in. dia. Bit can be used on standard shoulder type drill steel with F, H, D and K threads.



Fiber Glass Trolley Tap (15)

Fused trolley tap that provides a positive electrical connection, stops cable and insert pull-outs, and that is fire resistant is now available from Standard Devices Co. Molded threads in the top of fiber glass case hold hook.



Push Button Stoper (16)

Designated Model R68, Gardner-Denver's automatic water controlled stoper offers a water on—air on, and water off—air off cycle. Stoper is equipped with automatic blowing through the chuck end, keeping mud and cuttings out of the drill. Lightweight aluminum feed legs, direct or telescopic feed, are available. Steel sizes used are 7/8 to 1 in., hex or quarter octagon.

New 40-Ton Truck (18)

Diesel (600 hp) rear dump 40-ton truck developed by Autocar Div., White Motor Co., will operate at speeds up to 33 mph. Model AP-40 has planetary gear drive rear axles and a 30-hp starting engine. Box is all-welded, one-inch carbon steel construction.

Okonite Increases Wire-Making Capacity, Installs New Cable Testing Equipment

Approximately $2-million worth of new machinery has been installed in Okonite Co.'s North Brunswick plant to increase Okonite's wire and cable making capacity by 15 to 20%. Plant was designed to make it possible to swadge down aluminum sheathed cable in lengths exceeding 1,000 ft. Feature of the plant, visited by *E&MJ*, is the electrical testing tanks, where reels, 9 ft dia, can be submerged in water for minimum of 8-hour test runs. Elaborate safety measures are taken to protect employees and the cable being tested. After vulcanization, cable passes through three test units: insulation thickness, ionization and X-ray.

Continued on page 39. For more details, use card opposite page 42.

Athey PR20 - Cat DW20 has 34-ton, 22.5 cu. yd. capacity. Four-wheel tractor gives speeds up to 32.1 MPH and good roadability for long hauls.

Athey PR15-Cat DW15 has 22-ton capacity and top speed of 37.2 MPH for high-speed hauling and dumping.

Athey PR21-Cat DW21 features 34-ton, 22.5 cu. yd. capacity, articulated design, top maneuverability, standard or heated body.

Athey PD20-Cat DW20 has 30-ton capacity, speeds up to 32.1 MPH, dumps "on-the-go," for non-stop cycles.

Engineered

for your specific hauling needs

There's an Athey-Cat hauling unit designed for your particular job — no matter what the conditions or the materials you handle. There are rear dumps for maneuverability and high speed, side dumps for on-the-go dumping, bottom dumps for high volume hauling. All are engineered for specific hauling conditions.

Having just the right hauling unit on your job makes a big difference in your profit. And Athey-Cat Trailer-Tractor units always give higher production, lower maintenance, and a bigger profit on every load.

Call in your Athey-Caterpillar Dealer for an analysis of your job and an expert equipment recommendation. Find out how just the right hauling unit can save you money. Athey Products Corporation,
5631 West 65th Street,
Chicago 38, Illinois.

THE *Complete* TRAILER LINE... *by the Leader*

Athey

"Two shifts a day for more than two years

. . . and with only a few minor repairs. We're completely satisfied." That's the report from Societa Talco e Grafite Val Chisone operating Mancha Little Trammers in their talc mine in northern Italy.

In other mines, Little Trammers have reduced the cost of tramming as much as 75 per cent . . . and, often do work both men and animals find impossible. Neither climate, altitude nor poor ventilation can slow them down.

Mancha Little Trammers are small enough for narrow drifts, easily transferred from level to level. They not only handle heavy ores and waste with ease and economy, but are also used for moving mucking machines, drill jumbos, timber, supplies, and men.

They are made to last for years, are safe and easy to operate. That's why Little Trammers pay for themselves through savings in a very short time. They'll do the same for you, too.

Write us for complete information.
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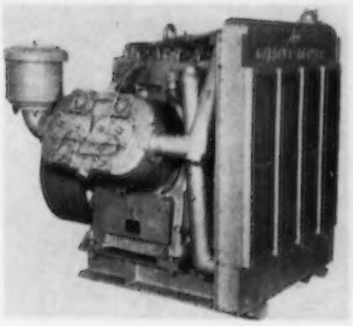
Halsted Street and 48th Place • Chicago 9, Illinois • Cable Address: Mancha, Chicago
Mancha representatives are located in principal mining areas throughout the world.



Two-Stage Compressor (25)

Gardner-Denver offers Model WBN, a 200-hp, two-stage packaged unit that takes up only 34 sq ft of floor space. Needs no special base, just bolt it down and hook on the power. Available with tube-type intercoller or self-contained radiator-intercooler.

Rotary Compressors (27)

Le Roi Div., Westinghouse Air Brake Co., is introducing a line of portable, two-stage, sliding vane, rotary air compressors. Model 600RD2 is rated at a free air capacity of 600 cfm. Compressor is coupled to a GM 71 diesel with hydraulically activated clutch.

Rotary Compressors (26)

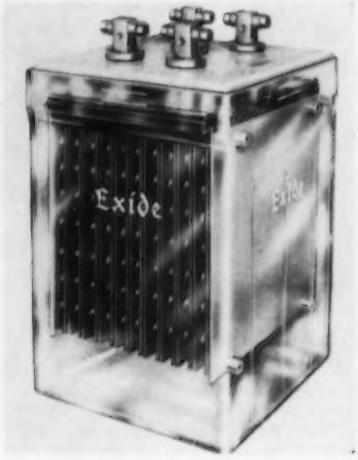
Gardner-Denver has added two new rotary compressors to the company line—RP125 and RP365. Clutch is located between engine and compressor. Model RP125 has stationary tow bar and is available with either gasoline or diesel power. Model RP365 has movable tow bar and diesel engine.

Recording Tachometer (20)

General Electric Co. has developed a recorder that measures and records speed with an accuracy of plus or minus 0.1% of measured speed. Designed for GE's dc tachometer generators, the device can be calibrated in rpm, fpm, or similar units to measure speed on many industrial machines.

Oil Bath Air Cleaner (21)

Type P low resistance-high efficiency oil bath air cleaner insures 100% of damaging dust removal through thorough mixing of incoming air and oil and positive drainage from the filter pads. Units are available with from 3100 to 21,000 maximum cfm capacities, according to American Air Filter Co., Inc.



Plastic Jar Batteries (23)

Strong, lightweight heat resistant polystyrene battery jars assure permanent leak-proof construction and increase electrolyte volume in Electric Storage Battery Co.'s line. This new F series of Exide-Machex batteries are rated at from 415 to 996 amp hours and the F series Exide-Tytex at from 469 to 1,173, both at the eight-hour discharge rate. Plastic jars enable Exide to increase rated capacity of batteries by 11% over glass jar construction.

Belt Splicer (24)

National Mine Service Co. is introducing a lightweight 17½-lb splicing unit called the Hayden Autoclip. Operation is simple. Magazine is loaded with hooks, and the machine moves to a new hook position each time the handles are opened after inserting a hook.

Continued on page 40. For more information, use card opposite page 42.

A COMPLETE REFRACTORIES SERVICE . . . *for the Copper Industry*

Three types of basic brick—RITEX, GREFCO, STEELKLAD for the three basic processes—smelting, converting and refining. Each type of brick available in the ranges of composition—Magnesite, Magnesite-Chrome, Chrome-Magnesite and Chrome—required to adapt to variations in metallurgical processing.

RITEX—chemically bonded for low cost, superior workmanship, resistance to spalling, ready availability.

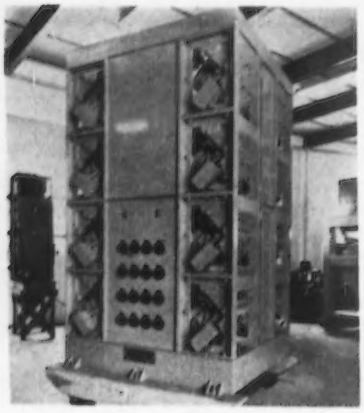
GREFCO—conventional type bonded by tunnel kiln high temperature firing, for maximum strength and hardness.

STEELKLAD—steel encased on two, three or four sides and for special jobs, steel plates incorporated in the brick interior as well—for maximum resistance to spalling in the most severely treated exposed walls.

RITEX, GREFCO and STEELKLAD—each the result of many years of intimate knowledge of the copper industry and careful study of service conditions, each prepared from the best available raw materials and made with the most modern manufacturing facilities—all within easy access to your operation.

GENERAL REFRACTORIES CO.
Philadelphia 2, Pa.

GENERAL REFRACTORIES



Dry Magnetic Separator (30)

According to J. Hall Carpenter, president, Carpco Mfg., Inc., Carpco's 16-rotor high intensity induced roll magnetic separator is one of the highest intensity units ever built. It has dry feed rates from 8,000 to 32,000 lb per hour and can be set up to recirculate either magnetic or non-magnetic fractions. Flux density of each rotar rotor can be adjusted. Automatic controls start and stop the feed. At maximum flux, the separator produces 176,000 magnetic lines of force per square inch.

Fabric Dust Collector (31)

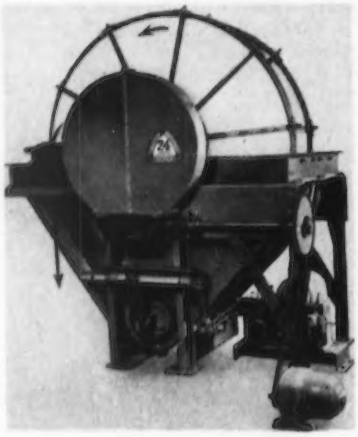
Dust is displaced from the filter media by a reverse jet of air blown in by a Venturi nozzle placed at the top of the bags. Called Micro-Pulsaire, Pulverizing Machinery Div., Metals Disintegrating Co., Inc.'s units operate at up to 99.9% efficiency, depending on dust size. Units are available with 9, 20, 30 and 48 filter tubes, in either 4- or 6-ft lengths. Capacities range from 400 to 600 cfm in 9-tube unit to 3,350 to 5,000 cfm in largest size.

One Man Scraper (39)

Elba Werk GmbH & Co., Ettlingen, Baden, makers of the well-known Puller-Seilzugmaschinen (cableway excavators), now offers a one-man scraper assembly, called "Micky-Mot". Unit handling the hand-held scraper proper consists of a three-wheel carriage or chassis upon which is mounted a Simplex-Puller powered by a 6-hp diesel engine. Operation of the carriage is remotely controlled by a pull cable. Uniqueness of the device lies in the possibility of applying the motive power of the diesel engine to the carriage drive proper via an electro-magnetic coupling flanged to the side of the carriage, thereby permitting the complete unit to move from one point to another. The "Micky-Mot" can be used anywhere that dozer tractors or excavators either are not available or cannot be effectively employed because of limited operating space.

Electromagnetic Boiler Feed Water Treatment (38)

Corrosion can be neutralized partially or entirely depending upon the composition of the liquid and scale formation can be combatted, according to Cepi-American, Inc., by the simple practice of wrapping an electromagnetic coil around the incoming feed water line. The electromagnetic force set up within the liquid prevents corrosion and scale by forcing the chemicals, dissolved in the water, to form finely divided precipitates that do not adhere to the metal surfaces, and that can be removed from the system through regular blow-down. Cepi-American has installed tens of thousands of these units in boiler water and heavy solids-laden liquid applications. Patents are held in Europe and the U. S.



Agitated Disk Filter (34)

Denver Equipment Co.'s new agitator type disk filter agitates the pulp through a pulsating unit located below the filter disks. Agitating speed is adjustable. Agitator can be removed as a unit, having no packing gland, sealing water or bearings in the tank. Available for all Denver disk filters.

Vacuum Melting Furnace (37)

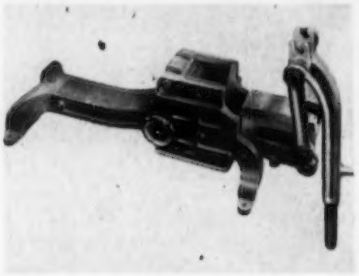
Consumable electrode vacuum remelting furnace that melts titanium, zirconium, high-alloy steels, and other ferrous and nonferrous alloys is now available from Lectromelt Furnace Division, McGraw-Edison, through a licensing agreement with Titanium Metals Corp. and Allegheny Ludlum Steel Corp.

Corrosive Liquid Filters (40)

R. P. Adams Co. has redesigned its line of small filters for corrosive liquids to handle 75% more filter area. Poro-Stone, Poro-Carbon and Poro-Screen models are available. Adams also makes a line of rubber-lined and lead-lined filters.

Flocculant (32)

Good-rite K-720 in low concentration causes rapid, thorough aggregation of finely divided particles, resulting in fast settling, easier dewatering, according to B. F. Goodrich Chemical Co. K-720 is available as a dry resin or water solution.

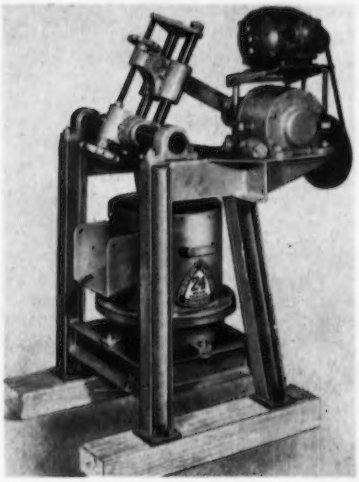


Laboratory Jaw Crusher (36)

Hand operated jaw crusher has been designed by Knapp & Bates Ltd. for crushing small quantities of material. Machine can be operated to handle 40 to 45 lb per hour of tough rock, reducing 1½-in. to ⅛, although the product may be varied by adjusting the setting.

Closed Circuit TV (22)

Allen B. Du Mont Laboratories, Inc. now has a complete line of industrial TV cameras, viewers and circuits designed for visual monitoring out-of-the-way places.



Diaphragm Pump (35)

Denver Equipment Co.'s 4-in. adjustable stroke diaphragm pump has longer stroke and 75% higher capacity, yet is only 50 in. high. Capacities to 70 gpm for simplex design and 140 gpm in duplex are possible depending on specific gravity.

I KNOW, BUT I'M
CAN WE HELP? WE

Longyear

Bringing up core . . . with drill rods *in the hole*

Longyear Wire Line equipment allows more drilling time per shift . . . improves core recovery!

Another core sample heading for the box and the crew about to go for more *without pulling up the drill string.* That's drilling with Longyear Wire Line equipment!

Drillers using the Longyear Wire Line Core Barrel lower an "overshot" through the drill string to bring up the Inner Tube containing core. Here's what this can mean to *your* operation:

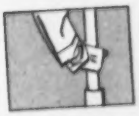
1 The drill string normally remains in the hole except when it is necessary to replace the bit. This eliminates much of the hard labor of drilling and allows more actual drilling time per shift.

2 Caving, the major cause of blocking and bit damage, is minimized. There is little chance for caving while the drill string is in the hole—which is most of the time.

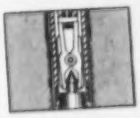
3 Longyear Wire Line Core Barrels are equipped with the water shut-off valve. In closed circuit drilling (possible with Longyear transmission pumps), the shut-off valve gives an immediate, positive indication of a block in the core barrel, eliminating costly "hunches" on the part of the drill runner.

Wire Line experience includes hundreds of thousands of feet drilled in many kinds of formations. Reports consistently show lower costs per foot of core recovered. In one overseas operation, switching from conventional NX equipment to BX Wire Line increased footage from ten to forty-seven feet per shift. In most cases when drilling in ground that is difficult to core, Wire Line improves core recovery substantially.

Looking ahead to your next drilling project, keep in mind that Longyear offers a complete line of Core Barrels and expert technical assistance in the selection of the right equipment for the formation you want to drill.



At end of core run, overshot assembly is lowered by wire through drill string.



At bottom drill string, overshot latches on to spear of inner tube.

Core-bearing inner tube reaches the surface, is freed from overshot.

Core is removed. Meanwhile, stand-by inner tube is dropped into the hole so drilling can be resumed as soon as it is in position.

Longyear

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Diamond Core Drill Manufacturers • Core Drilling Contractors • Mining Engineering and Geological Consultants

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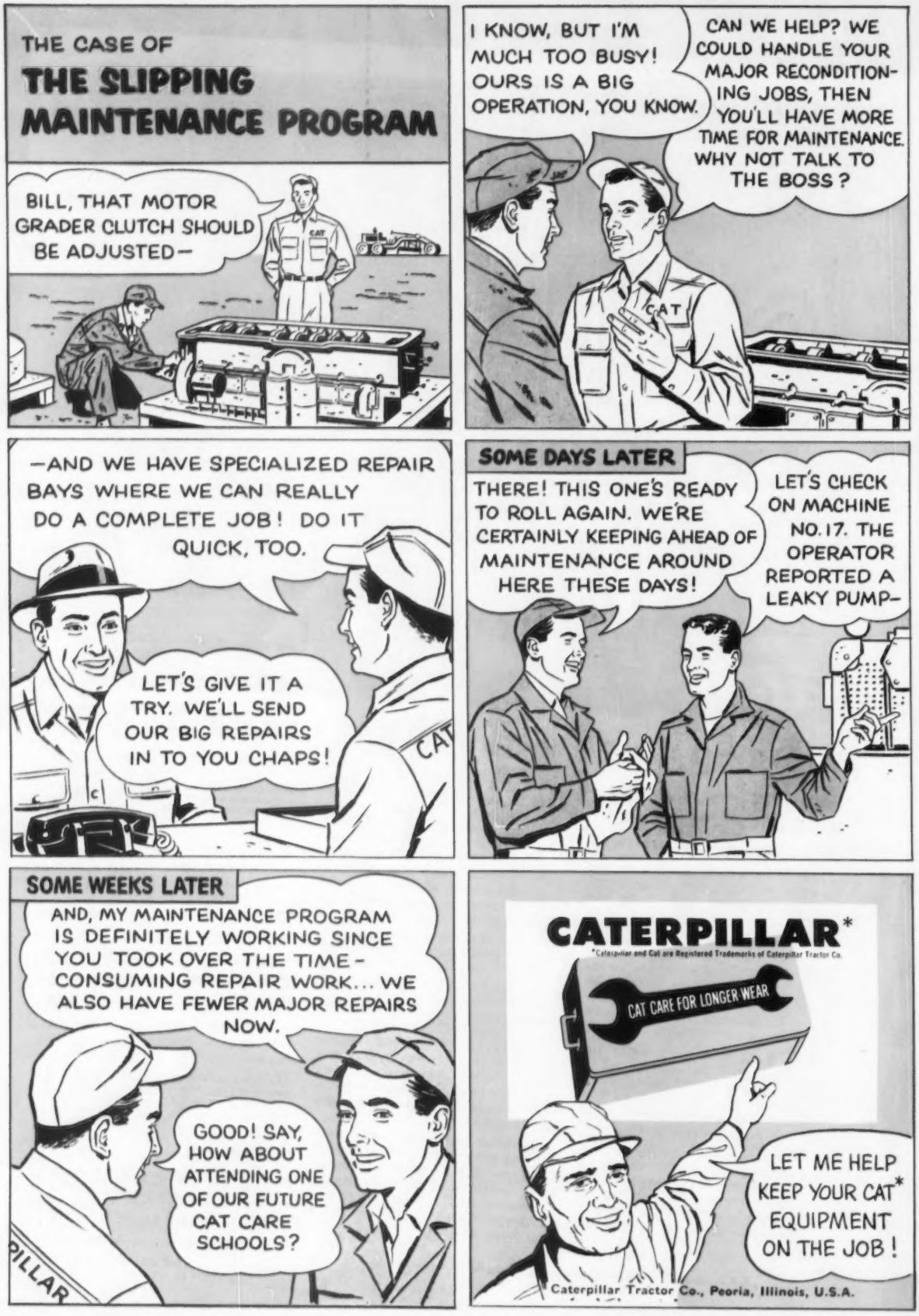
THE CASE OF
THE SLIPPING MAINTENANCE PROGRAM
BILL, THAT MOTOR GRADER CLUTCH SHOULD BE ADJUSTED—
I KNOW, BUT I'M MUCH TOO BUSY! OURS IS A BIG OPERATION, YOU KNOW.
CAN WE HELP? WE COULD HANDLE YOUR MAJOR RECONDITIONING JOBS, THEN YOU'LL HAVE MORE TIME FOR MAINTENANCE. WHY NOT TALK TO THE BOSS?
CAT
—AND WE HAVE SPECIALIZED REPAIR BAYS WHERE WE CAN REALLY DO A COMPLETE JOB! DO IT QUICK, TOO.
LET'S GIVE IT A TRY. WE'LL SEND OUR BIG REPAIRS IN TO YOU CHAPS!
SOME DAYS LATER
THERE! THIS ONE'S READY TO ROLL AGAIN. WE'RE CERTAINLY KEEPING AHEAD OF MAINTENANCE AROUND HERE THESE DAYS!
LET'S CHECK ON MACHINE NO. 17. THE OPERATOR REPORTED A LEAKY PUMP—
SOME WEEKS LATER
AND, MY MAINTENANCE PROGRAM IS DEFINITELY WORKING SINCE YOU TOOK OVER THE TIME-CONSUMING REPAIR WORK... WE ALSO HAVE FEWER MAJOR REPAIRS NOW.
GOOD! SAY, HOW ABOUT ATTENDING ONE OF OUR FUTURE CAT CARE SCHOOLS?
CATERPILLAR*
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
CAT CARE FOR LONGER WEAR
LET ME HELP KEEP YOUR CAT* EQUIPMENT ON THE JOB!
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

E&MJ NEW PRODUCTS DIGEST (*Continued*)

E&MJ NEW PRODUCTS DIGEST (*Continued*)

For More Details on New Product Items and For Copies of Free Literature Listed Below — Circle the Proper Number on Card. Be Sure to Give Your Name and Address.

For Your Files

This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.

EXPLORATION AND MINING

STRATA, the quarterly magazine of Joy-Sullivan Ltd., subsidiary of Joy Manufacturing Co., contains a review of current tunnelling techniques. **(50)**

CANNED PUMPS in fractional horsepower rating by Corley Co., Inc. are the subject of an 8-page release. **(51)**

UTILITY TRACTOR, the International 350 by International Harvester Co., is described in 4-page flyer. **(52)**

MAN-TRIP RAIL CARS developed by Lee-Norse Co. are presented in a 6-page release. **(53)**

BOWL SCRAPER — International Harvester's "55 Payscraper," is covered in eight pages. **(54)**

HAZARD FINDER—how to locate the hidden probabilities of electrically ignited explosions in your plant is the subject of an 8-page bulletin prepared by Crouse-Hinds Co. **(55)**

HOW A CATERPILLAR SERVICEMAN MAKES HIMSELF AVAILABLE TO YOU is the subject of an 8-page release now available from Caterpillar Tractor Co. **(56)**

INDUSTRIAL TRACTORS by Ford Motor Co. are described in 12-page bulletin now available from the company. **(57)**

CLARK EQUIPMENT has available a condensed catalog on their line of powered material handling units. 16 pp. **(58)**

AUXILIARY EQUIPMENT

DIESEL ELECTRIC GENERATORS manufactured by Caterpillar Tractor Co. are shown to advantage in an 8-page release. **(59)**

STEEL PANEL building types now made available from Stefco Manufacturing Co. are illustrated in 4 pp. **(60)**

PERFORMANCE RECORDS OF ABRASION RESISTING steel are set forth in Joseph T. Ryerson & Son, Inc.'s latest 4-page bulletin. **(61)**

DUST CONTROL AND ROAD STABILIZATION with Orzan A1-50 is discussed in Crown Zellerbach Corp.'s 4-page release. **(62)**

INSULATING MATERIALS used by Westinghouse Electric Corp. are discussed in their 8-page release. **(63)**

BREAKING LUBRICATION BARRIERS is the title of Alpha Molykote Corp.'s 4-color, 16-page brochure. **(64)**

MERCURIAL VACUUM GAGES AND BAROMETERS in the Precision Thermometer & Instrument Co. line are illustrated in a 4-page bulletin. **(65)**

CHEMICALS and their physical properties as manufactured by Carbide & Carbon Chemicals Co. are detailed in the company's 23-page catalog. **(66)**

REVERSIBLE GEARED MOTORS in the Barber-Colman line and designed for operating regulators and industrial controls are described in a 4-page release. **(67)**

STAINLESS AND HIGH ALLOY PIPE AND TUBING from ⅛- to 40-in. O.D. is available from Trent Tube Co., according to their illustrated 48-page catalog-bulletin. **(68)**

MILLING AND SMELTING

INDEX TO DECO TREFOIL now contains the years 1955 and 1956. According to Denver Equipment Co., the index is now complete from 1938 through 1956, containing references to all items appearing in the *Trefoil* during those years. **(69)**

AIR AND HYDRAULIC CONTROL VALVES designed by C. B. Hunt & Son, Inc., are illustrated in 12-page bulletin. **(70)**

INSTRUMENTS AND CONTROLS for pressure, flow, temperature, gas analysis, and controllers are cataloged in Hays Corp.'s 12-page condensed catalog. **(71)**

DOW CORNING ANTIFOAM B costs less than any other silicone

AUG. 1957

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6	20	34	48	62	76	90
7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
10	24	38	52	66	80	94
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7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
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11	25	39	53	67	81	95
12	26	40	54	68	82	96
13	27	41	55	69	83	97
14	28	42	56	70	84	98

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E&MJ NEW PRODUCTS DIGEST (*Continued*)

defoamer on the market, according to Dow Corning Corp. in their 4-page description of this new product. **(72)**

TEFLON FILTER FABRIC, by Du Pont, is described in 6-page release published by E. I. du Pont de Nemours & Co. **(73)**

HEAT EXCHANGER selection demands exacting considerations, according to Condenser Service & Engineering Co., Inc. and the company offers their 16-page catalog-bulletin to help you pick the right unit. **(74)**

TANK FILTER, designed by Bowser, Inc. for filtering lubricating oils and coolants, is completely automatic, according to 4-page release. **(75)**

STANDARD - HERSEY DRYING SYSTEM for treating sewage sludge and industrial waste is illustrated in 4-page bulletin published by Standard Steel Corp. **(76)**

HARDINGE PRODUCTS bulletin No. 100-A presents most of the metallurgical equipment in the company line in brief form. 8 pp. **(77)**

VIBRATING PAN-TYPE AND GRIZZLY FEEDERS have been cataloged by Simplicity Engineering Co. Catalog gives specifications and engineering information on six different models of Simplicity feeders with capacities up to 1,000 tph. **(78)**

HOW TO USE RADIATION TO GAGE SHEET MATERIALS is 36 pages and may give you new ideas on how to use radiation to control your operation. Published by Tracerlab, Inc. **(79)**

JOY MICRODYNE DUST COLLECTOR description and operating data are presented in 4-page bulletin available from Joy Manufacturing Co. **(80)**

LITERATURE FOR SALE

INVESTMENT CASTING ENGINEERING AND DESIGN MANUAL published by Investment Casting Institute, 27 East Monroe St., Chicago 3, Ill., as 50 pp and represents the most complete and authoritative information on the investment casting process. Illustrated. Price $5. This is not a free literature notice. Write direct to the Institute.

ROCKS AND MINERALS prepared by Eckert, Florence, Colo. is a 96-page catalog of the company's mineral research and prospecting supplies. Lists equipment and mineral specimens and their price. Illustrated. Price $1, but free on orders over $10. This is not a free literature notice. Write direct to Eckert.

AUXILIARY EQUIPMENT

ASBESTOS-CEMENT SEWER PIPE and the exclusive Fluid-tite coupling developed by Keasbey & Mattison Co. is described in an 8-page bulletin. **(81)**

WIRE AND RODS, CARBON STEEL PRODUCTS MANUAL available from American Iron and Steel Institute makes available to purchasers, producers and consumers information covering the major carbon steel products. Tolerances, methods of inspection, sampling and chemical analyses and definitions are covered in 118 pages. **(82)**

ALUMINUM FORMS THE FUTURE is the title of Reynolds Metals Co.'s 32-page release that tells the story of Reynolds' McCook Plant, located at McCook, Ill. **(83)**

HASTELLOY — CORROSION RESISTANT ALLOYS catalog released by Haynes Stellite Co. has 104 pp, gives physical properties, mechanical properties, corrosion resistance and fabrication characteristics of Hastelloy. **(84)**

COPPER AND COPPER ALLOY catalog prepared by American Brass Co. contains metal specifications and compositions in 27 pages. **(85)**

HARD WORK WANTED is a booklet prepared by Caterpillar Tractor Co. that contains on-the-spot photos of earthmoving equipment at work. Booklet describes working conditions, operations and auxiliary equipment. **(86)**

NECESSORIES, a 12-page catalog released by International Harvester Co., contains tractor accessories considered necessary for comfort, economy, safety or convenience. **(87)**

MOTOR STARTERS AND CONTACTORS in Allis-Chalmers Mfg. Co.'s sizes 4, 5 and 6, 50 to 400 hp, are described in a 12-page bulletin. **(88)**

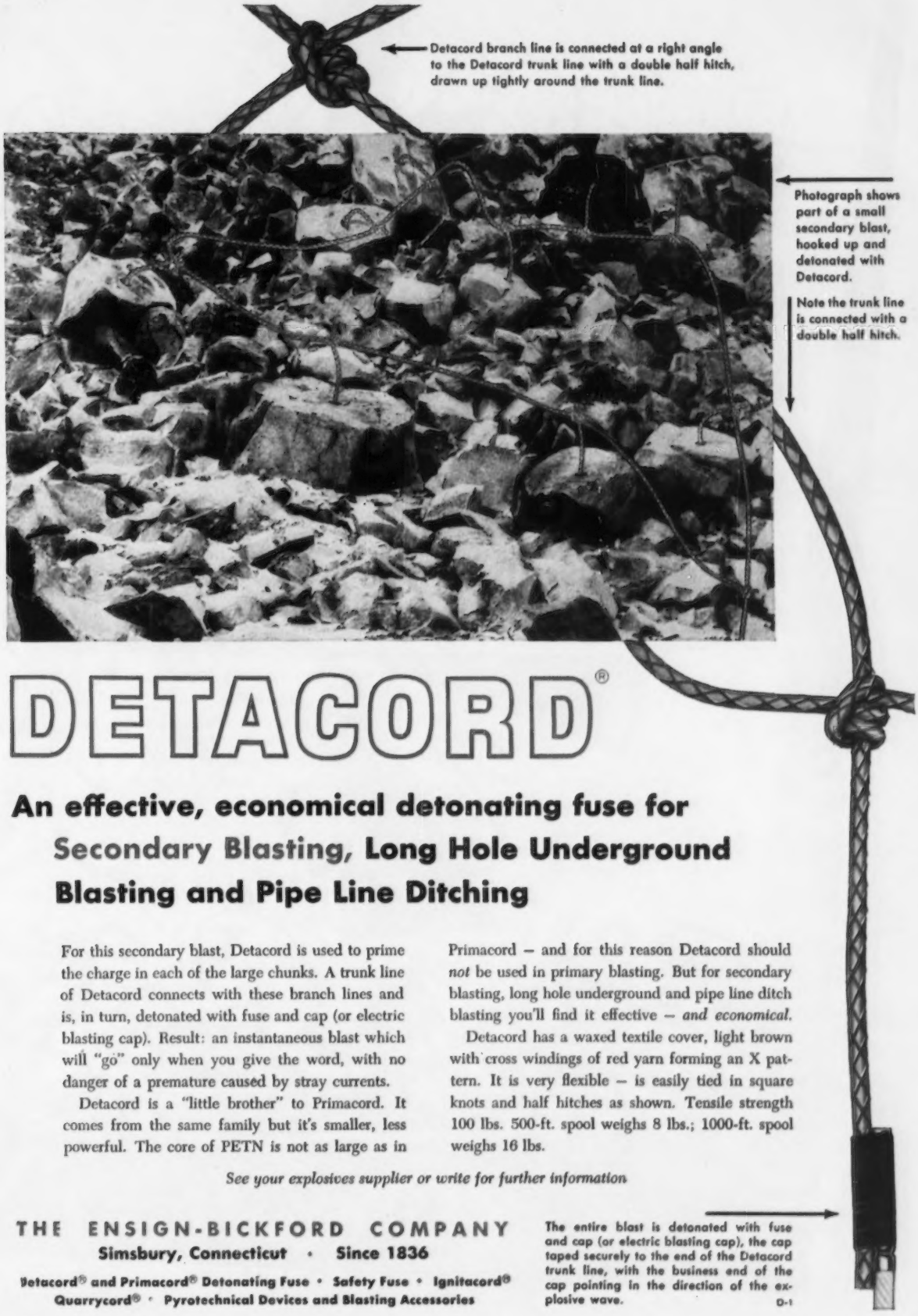
HIGH VACUUM VALVES available from NRC Equipment Corp. are detailed in 32 pp. Included in the catalog is a discussion of the requirements imposed by high vacuum services which often combine with severe corrosion conditions, high temperature and other mechanical stresses. **(89)**

TORQUE CONVERTER data sheet available from National Supply Co. has 4 pp, contains and explains twelve features of single stage torque converters. Representative types and makes of engines with which the 17 sizes of National converters can be used in the 100- to 1,000-hp range are listed. **(90)**

SIGNALKORE, American Chain & Cable Co., Inc.'s wire rope that offers continuous communication within the cable itself, is described in a 4-page release. **(91)**

NORDBERG FOUR CYCLE ENGINES are described in 4-color 16-page bulletin now available. Diesels, Duafuel and Spark Ignition Gas engines are shown. Also the operating advantages of Nordberg Mfg. Co.'s Supairthermal engine cycle is illustrated and explained. **(92)**

LIQUID CHEMICAL FEEDERS IN STAINLESS STEEL for controlled feeding of liquids with precision, dependability and low cost are described in Clarkson Co.'s 4-page brochure. **(93)**


Detacord branch line is connected at a right angle to the Detacord trunk line with a double half hitch, drawn up tightly around the trunk line.
Photograph shows part of a small secondary blast, hooked up and detonated with Detacord.
Note the trunk line is connected with a double half hitch.
The entire blast is detonated with fuse and cap (or electric blasting cap), the cap taped securely to the end of the Detacord trunk line, with the business end of the cap pointing in the direction of the explosive wave.
D-1

DETACORD®

An effective, economical detonating fuse for Secondary Blasting, Long Hole Underground Blasting and Pipe Line Ditching

For this secondary blast, Detacord is used to prime the charge in each of the large chunks. A trunk line of Detacord connects with these branch lines and is, in turn, detonated with fuse and cap (or electric blasting cap). Result: an instantaneous blast which will "go" only when you give the word, with no danger of a premature caused by stray currents.

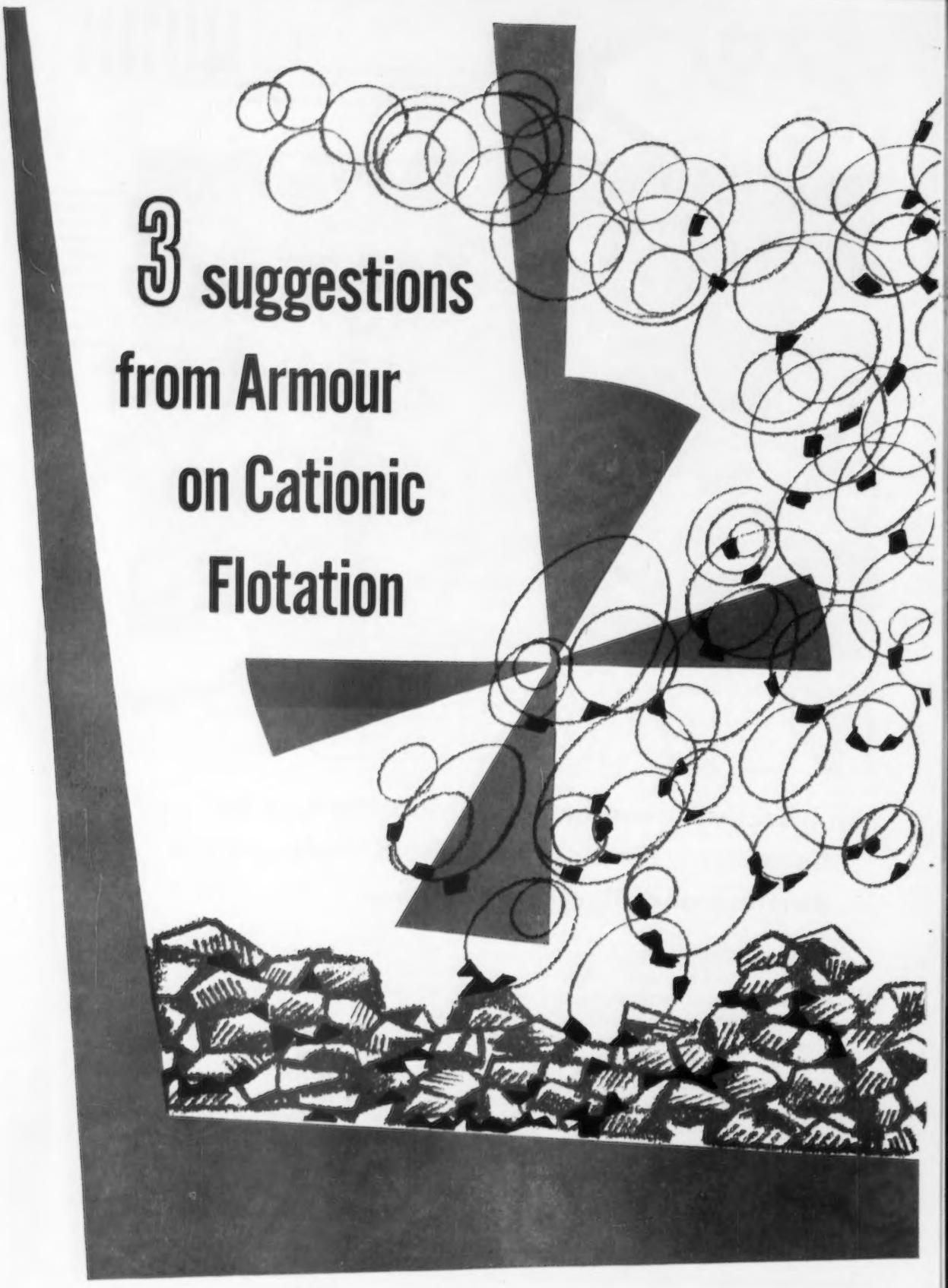
Detacord is a "little brother" to Primacord. It comes from the same family but it's smaller, less powerful. The core of PETN is not as large as in Primacord – and for this reason Detacord should *not* be used in primary blasting. But for secondary blasting, long hole underground and pipe line ditch blasting you'll find it effective – *and economical.*

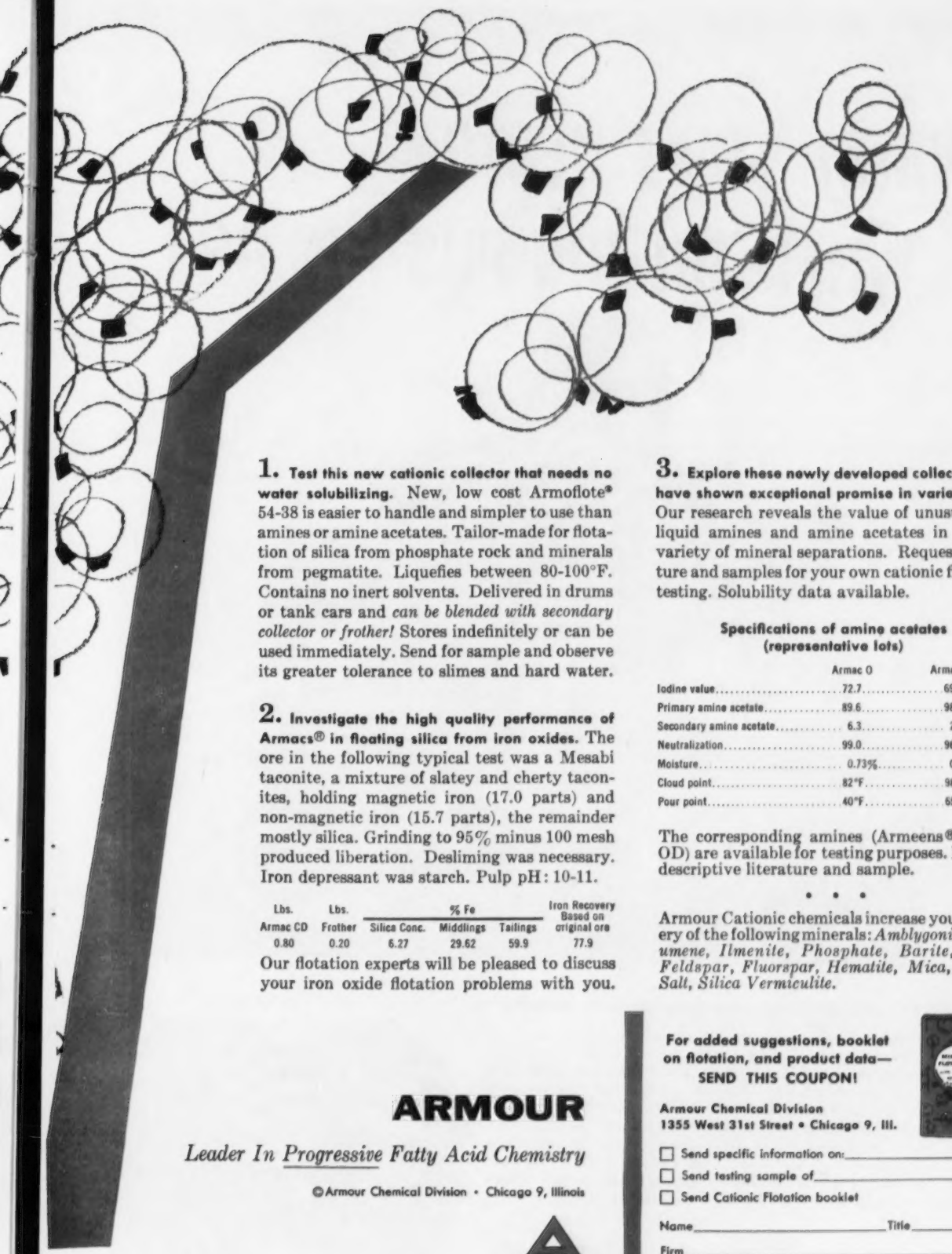
Detacord has a waxed textile cover, light brown with cross windings of red yarn forming an X pattern. It is very flexible – is easily tied in square knots and half hitches as shown. Tensile strength 100 lbs. 500-ft. spool weighs 8 lbs.; 1000-ft. spool weighs 16 lbs.

See your explosives supplier or write for further information

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut • Since 1836

Detacord® and Primacord® Detonating Fuse • Safety Fuse • Ignitacord® Quarrycord® • Pyrotechnical Devices and Blasting Accessories


3 suggestions
from Armour
on Cationic
Flotation



1. Test this new cationic collector that needs no water solubilizing. New, low cost Armoflote® 54-38 is easier to handle and simpler to use than amines or amine acetates. Tailor-made for flotation of silica from phosphate rock and minerals from pegmatite. Liquefies between 80-100°F. Contains no inert solvents. Delivered in drums or tank cars and *can be blended with secondary collector or frother!* Stores indefinitely or can be used immediately. Send for sample and observe its greater tolerance to slimes and hard water.

2. Investigate the high quality performance of Armacs® in floating silica from iron oxides. The ore in the following typical test was a Mesabi taconite, a mixture of slatey and cherty taconites, holding magnetic iron (17.0 parts) and non-magnetic iron (15.7 parts), the remainder mostly silica. Grinding to 95% minus 100 mesh produced liberation. Desliming was necessary. Iron depressant was starch. Pulp pH: 10-11.

Lbs.	Lbs.	% Fe			Iron Recovery
Armac CD	Frother	Silica Conc.	Middlings	Tailings	Based on original ore
0.80	0.20	6.27	29.62	59.9	77.9

Our flotation experts will be pleased to discuss your iron oxide flotation problems with you.

3. Explore these newly developed collectors that have shown exceptional promise in varied fields. Our research reveals the value of unusual new liquid amines and amine acetates in a wide variety of mineral separations. Request literature and samples for your own cationic flotation testing. Solubility data available.

Specifications of amine acetates (representative lots)

	Armac O	Armac OD
Iodine value	72.7	69.4
Primary amine acetate	89.6	98.5
Secondary amine acetate	6.3	2.0
Neutralization	99.0	96
Moisture	0.73%	0.89%
Cloud point	82°F	98°F
Pour point	40°F	65°F

The corresponding amines (Armeens® O and OD) are available for testing purposes. Request descriptive literature and sample.

• • •

Armour Cationic chemicals increase your recovery of the following minerals: *Amblygonite, Spodumene, Ilmenite, Phosphate, Barite, Beryl, Feldspar, Fluorspar, Hematite, Mica, Potash, Salt, Silica Vermiculite.*

ARMOUR

Leader In Progressive Fatty Acid Chemistry

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For added suggestions, booklet on flotation, and product data— SEND THIS COUPON!

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WATCH FOR FIRESTONE WHEN THE BIG PUSH IS ON!

Firestone Rock Grips lead all tire choices where highways end—and big jobs begin!

Firestone Tubeless Rock Grips save time where you're pushing big projects. That's because of two great tread designs that carry your heavy equipment *over any terrain!* They eliminate your need for changing tires to match the job. You get the *full flotation* you need for sand and soft stuff. You get the *armored grip* you want for rough runs over broken rock. Safety-Tensioned *Gum-Dipped*® NYLON bodies combined with cut-resistant treads make these tires top choice for off-highway users. Your Firestone Sales Engineer can show you why you'll make them *your* top choice, too. Contact him today—through your local Firestone Dealer or Store.

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Firestone

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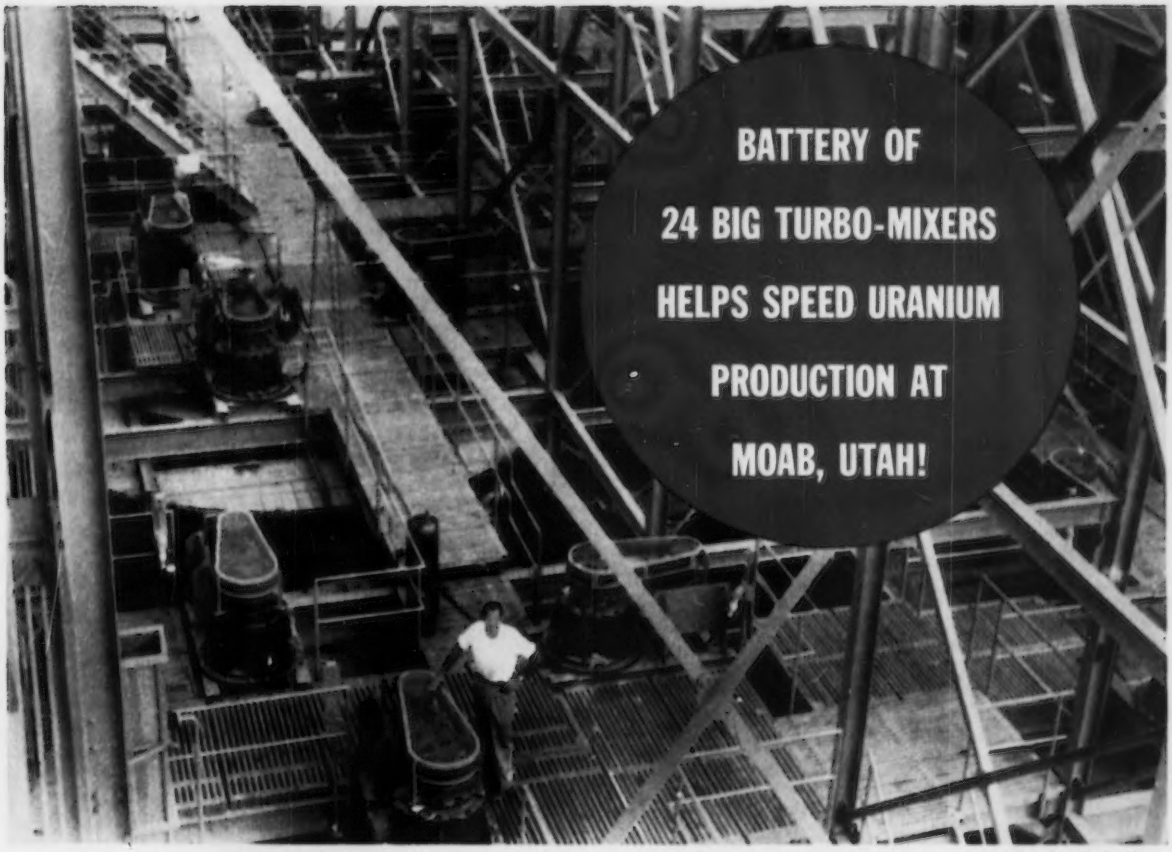

Leaching Plant designed by Knowles Associates, New York City

Each Turbo-Mixer can be vertically removed as a unit for rapid spare-assembly replacement

Uranium Reduction Corporation operates some of the largest leaching units in the industry—eight of their ten big leaching tanks depend on three 30-H.P. Turbo-Mixers per tank to suspend over one and one-half million pounds of uranium ore on a continuous flow basis. These Turbo-Mixers have operated without interruption since the plant went "on stream." Other Turbo-Mixers in the Metallurgical field are handling slurries of 75% to 80% solids. Turbo has specialized in this type of mixing for over 30 years. We'll be glad to tackle your difficult suspension problems or to conduct laboratory or pilot scale demonstrations with your observers.

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Please send me the following Turbo-Mixer Bulletin (s):

_____Minerals Processing Bulletin

_____Side Entering Propeller Mixer Bulletin

_____RDC Extraction Column Bulletin

_____General Turbo-Mixer Bulletin

Entering weight and dimensional data on control record at the press which forms refractory brick under high pressure. Representative control charts are shown above.

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

World's Most Complete Refractories Service

General Offices: PITTSBURGH 22, PENNSYLVANIA

QUALITY CONTROL—thorough and continuous—assures predictable and uniform

refractories performance

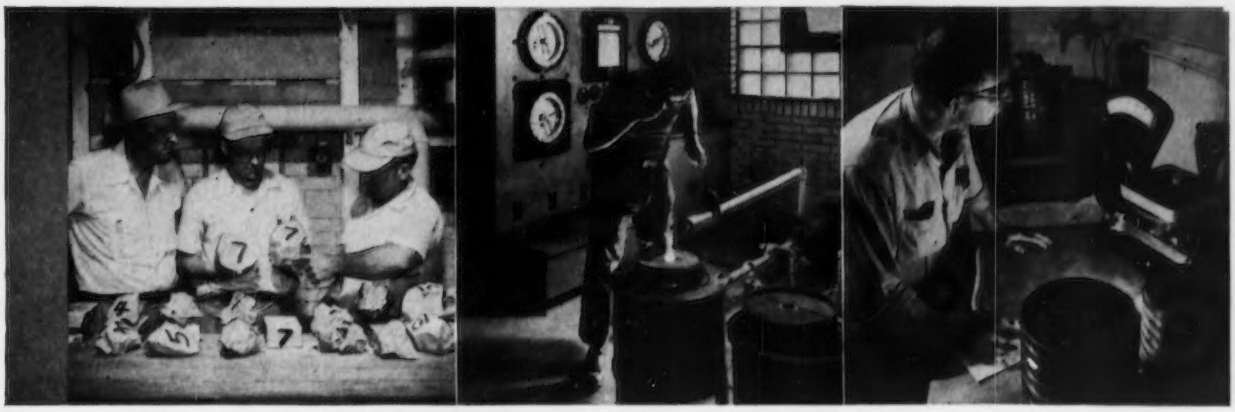
from Harbison-Walker products

Through Statistical Quality Control, Harbison-Walker maintains within closest commercial limits, the highest standards of all characteristics upon which depend the best and most uniform refractory service. Comprehensive control procedure extends from the raw materials through every manufacturing detail with the aid of instrumentation and precise laboratory testing. By this highly developed technique, uniformity of product is achieved which assures predictable and consistently uniform refractories performance. It is possible to estimate service life more accurately and plan furnace campaigns with confidence. With this established uniformity of quality, operating interruptions are fewer and maintenance costs are considerably reduced.

"Lump samples" of clay received from the mine are examined after test-firing.

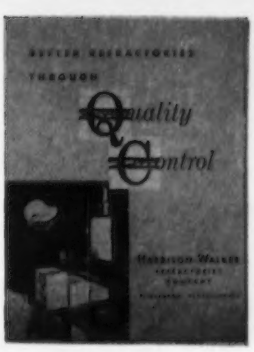
Determining refractoriness by the "Pyrometric Cone Equivalent" method.

Screen analysis of Brick Mix is an important control operation.



SEND FOR THIS BROCHURE

The program by which Harbison-Walker controls the properties and quality of the various refractories is described in detail in the new brochure *Better Refractories Through Quality Control.* It shows how uniformity is achieved and maintained in the refractories made from natural minerals from mines and quarries. A copy of this brochure will be gladly sent to you on request.



HARBISON-WALKER REFRACTORIES COMPANY
Pittsburgh 22, Pennsylvania

Please send me a free copy of your brochure, "Better Refractories Through Quality Control."

Name_____ Title_____

Company_____

Address_____

ON ANY MINE ELECTRICAL DISTRIBUTION SYSTEM YOU PLAN . . .

There's a General Electric cable to give the best-possible performance

In selecting a cable that best suits your requirements, it is important, of course, that you choose one that can withstand being dragged over jagged rocks and through water. In addition, the cable must be tough, flexible, resilient and abrasion-, sunlight-, oil-, acid-, and alkali-resistant.

Here are a few examples from General Electric's complete line:

Type SH-D—For use primarily with electric shovels, where a cable must be exceptionally flexible, resilient, and abrasion-resistant. Designed for maximum protection to personnel by the use of ground wires and individual flexible shields on the individual conductors.

Mine Power Cable—A nonmetallic-sheathed cable for primary distribution to load centers. Can be buried directly or installed in the open . . . insulation is resistant to ozone, heat and aging . . . non-metallic construction makes it light weight and easy to install.

CordX*—A heavy-duty, flexible cord suited to portable electrical equipment which encounters severe usage and where exceptional mechanical, moisture, heat, and chemical resistance is required. Has U. S. Bureau of Mines approval.

Interlocked Armor Cable System—For distribution systems in preparation plants and other similar applications. Provides for system expansion or relocation in the future without major modifications. Available with either varnished-cambric, rubber, thermoplastic, or asbestos insulation for power or control cables.

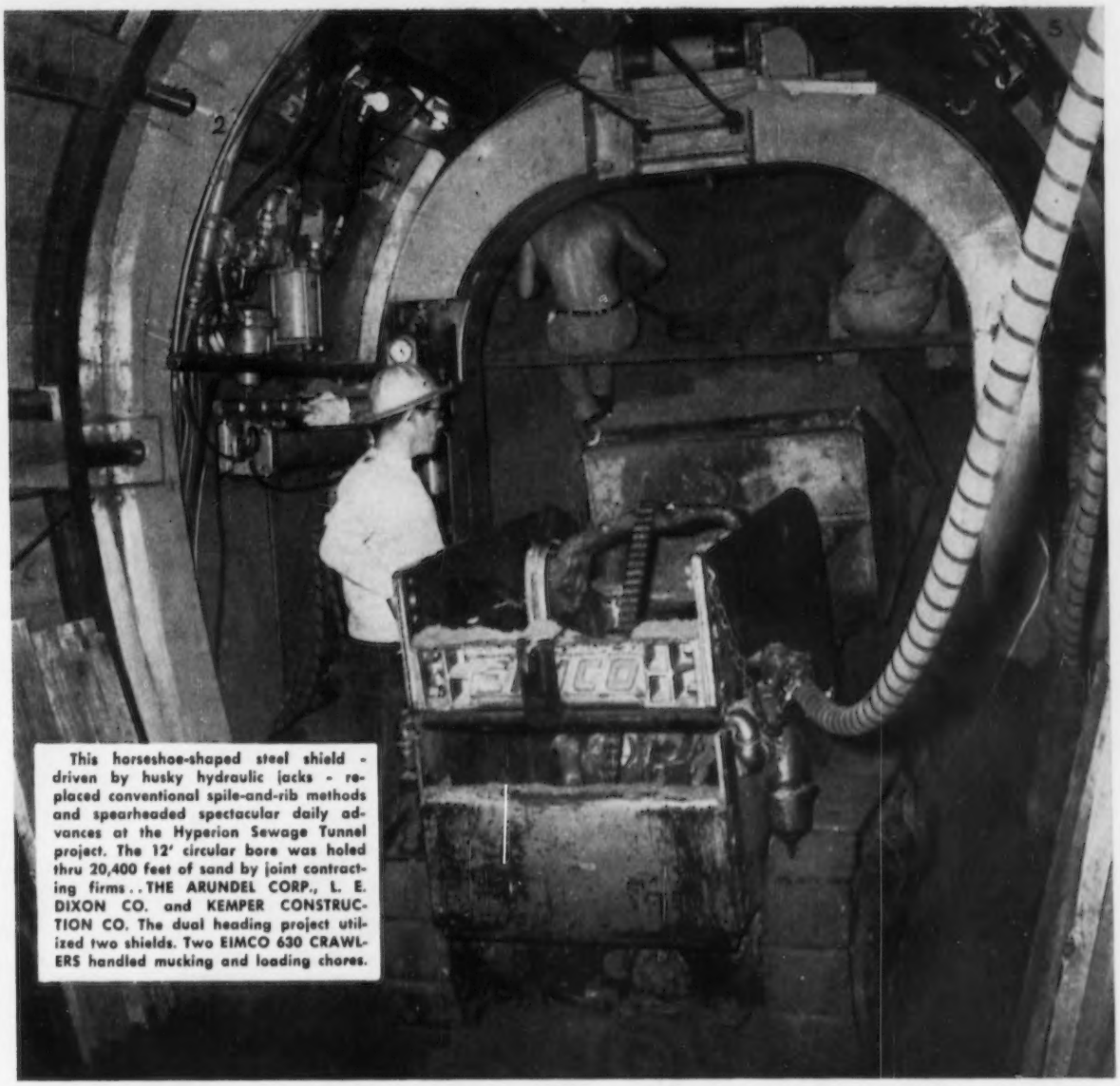
Mining Machine Cables, Types W and G—Designed for especially severe conditions, such as being dragged behind mining machines, hit by picks, run over by equipment. Is exceptionally flexible, resilient, and abrasion-resistant.

FOR FULL INFORMATION on how G-E cable can help you, write for complete data on the G-E line of wire and cable. Just address Section W215-895, Wire and Cable Department, General Electric Company, Bridgeport 2, Conn.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC



This horseshoe-shaped steel shield - driven by husky hydraulic jacks - replaced conventional spile-and-rib methods and spearheaded spectacular daily advances at the Hyperion Sewage Tunnel project. The 12' circular bore was holed thru 20,400 feet of sand by joint contracting firms . . THE ARUNDEL CORP., L. E. DIXON CO. and KEMPER CONSTRUCTION CO. The dual heading project utilized two shields. Two EIMCO 630 CRAWLERS handled mucking and loading chores.

'RECORD-BREAKING' TUNNEL DRIVERS USE EIMCO 630'S

LOS ANGELES, CALIF. - Completion of the Hyperion Sewage Tunnel by joint contractors, The Arundel Corporation, L. E. Dixon Company and Kemper Construction Company, had an important impact on the future of two groups: It gives the Los Angeles Citizenry a vital tube thru which additional sewage from outlying areas will be delivered to the huge Hyperion Treatment Plant . . . and it introduced to heavy construction industry a much faster driving method for running ground excavation.

Eimco 630 Excavators (one in each heading) were used to handle the loading. The Eimcos cleared sand from the base of two fast-driving shields . . tossing large tonnages over their backs into a 36 in. wide, 110 ft. long lowhead conveyor - which in turn filled 11-4 yd. muck cars.

Write today for full details on the Eimco 630 Excavator.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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B 274

Records of mining companies show Ni-Hard* nickel-alloyed white cast iron in ore grinding service cuts ball "make-up" 20% to 35% compared to the best hardened steel. *Registered trademark

For a list of authorized producers, write to

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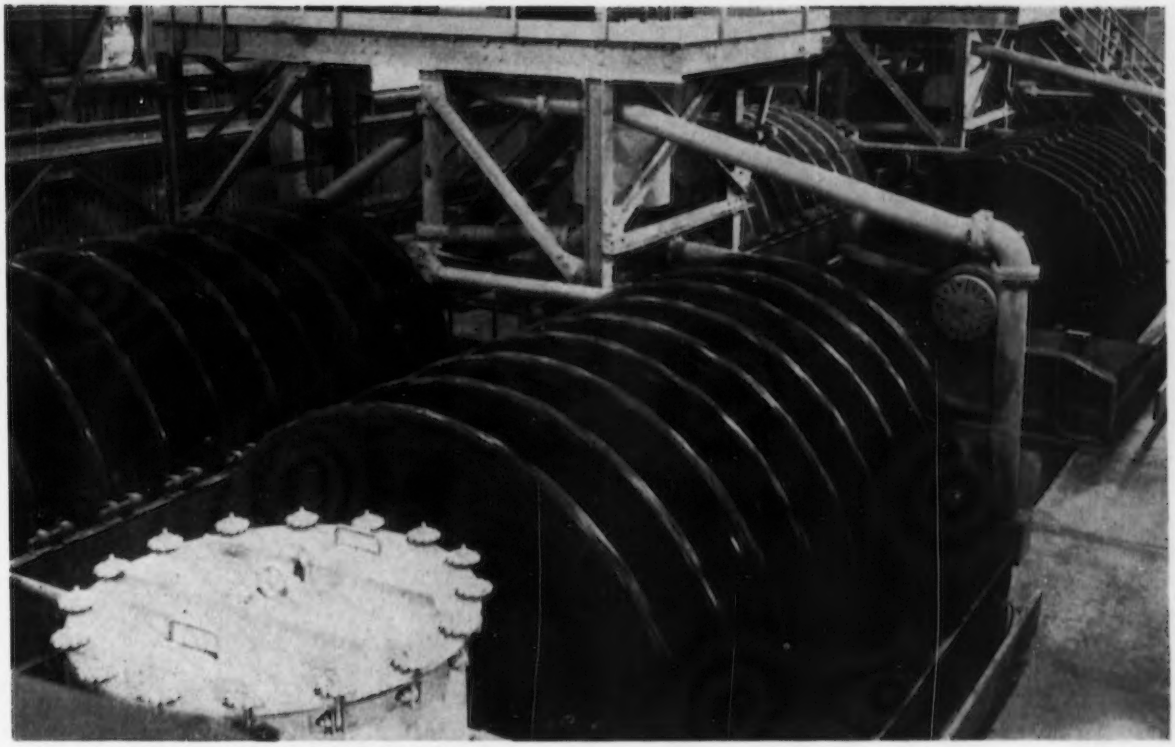


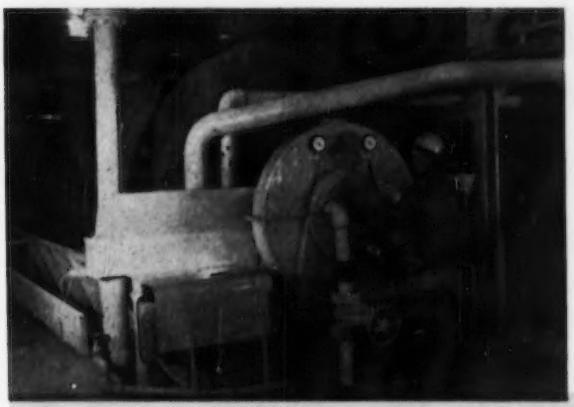
FOR UNIVERSAL ATLAS CEMENT CO.

Eimcos SAVE fuel - INCREASE Kiln CAPACITY

Universal Atlas Cement Company is one of America's few producers of **white** portland cement and is a major manufacturer of **gray** portland cement.

Since 1943 — when their modern 4-kiln **Northampton, Pa.** plant (1 white portland cement kiln and 3 gray portland cement kilns) began operating - **8 Eimco Disc Filters** (two over each kiln) have been getting economic advantages expected of the filtration cycle in a wet process cement flowsheet.

Ground limestone-white slurry for the white portland cement kiln has a 40% moisture content before filtration. Cakes produced on the Eimcos contain about 22% moisture. Each 8' 10" x 6 disc Eimco Filter has handled peak loads at a rate of **400** tons of white dry solids per 24 hour day... 53.4 lbs. per sq. ft per hour



Ground raw material for the gray kilns has a moisture content of 41% before filtration. Eimco cakes contain about 23% moisture. Each 8' 10" x 9 disc Eimco Filter can handle peak loads at a rate of **700** tons of gray dry solids per 24 hour day... 62.4 lbs. per sq ft. per hr.

This moisture reduction cuts BTU drying requirements and decreases kiln fuel costs. **Universal Atlas Cement plant** officials estimate kiln capacity is increased very materially thru Eimco Disc Filtration.

Initially, the plant experienced production slowdowns from filter media deficiencies. Thru extensive testing, Eimco was able to help this client select the media most advantageous to his operation... with substantial savings in media costs. Feed to each kiln now is mainly supplied by one filter which permits maintenance work on the other with no production shutdown... a factor that minimizes maintenance costs.

Write for details concerning this and other Eimco Filters.

THE EIMCO CORPORATION

SALT LAKE CITY, UTAH

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B 278

Roebling Royal Blue Wire Rope will take **shock** after **shock** after **shock!**

This, and the fact that Royal Blue is stronger than the strongest you have been using, has helped to make it the most widely favored rope in Roebling's history. It will work hard and last longer on *your* job. Your distributor or Roebling Sales Office will give you full information, or write: John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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When your spotting system is arranged to take full advantage of the Eimco 105 Excavator's ability to complete a cycle without turning... its loading capacity per $ of investment and maintenance can exceed that of conventional loaders or boom shovels by as much as 400%.

EIMCO 105 TRACTOR MOBILITY GETS *EXTRA* CAPACITY

Power shifting... operating simplicity... independent track reversal.. forward operating position... low center of gravity... are five important reasons why the Eimco 105 Tractor gets "extra" performance from its overhead or front-end loaders.

EIMCO 105 FRONT-END LOADER
2½ yard... 40,000 lb. break-out

EIMCO 105 EXCAVATOR
1½ yard... Overhead discharge

Eimco Unidrive, power-shift transmission combined with torque converter fluid drive, saves seconds every cycle and eliminates downtime due to burned facings or other clutch troubles. Without taking your left hand from the wheel, you simply manipulate power-shift levers for high, low, forward, reverse while the tractor is moving under full load. There's no reaching, no gear clash, no hesitation.

Independent track reversal is especially advantageous in front-end loading. It permits this 105 to pivot sharply from the muck pile and get material into trucks faster. It gets either loader out of trouble quickly... a big factor on hazardous jobs.

A 105 operator is always "on top of his work". Without standing or "craning" his neck, he can see to attack the muck pile at the best spot for fast loading. This, combined with operating ease, greatly reduces fatigue... gets greater man-hour efficiency.

Low center of gravity gives the 105 tractor extra stability... permits it to traverse 100% grades without tipping.

This combination of extreme tractor mobility and one of two high utility loaders, gives you a wide choice in adapting an earth-moving technique most profitable for your job requirements.

An Eimco Sales Engineer will help you decide which model fits into your job scheme most profitably.

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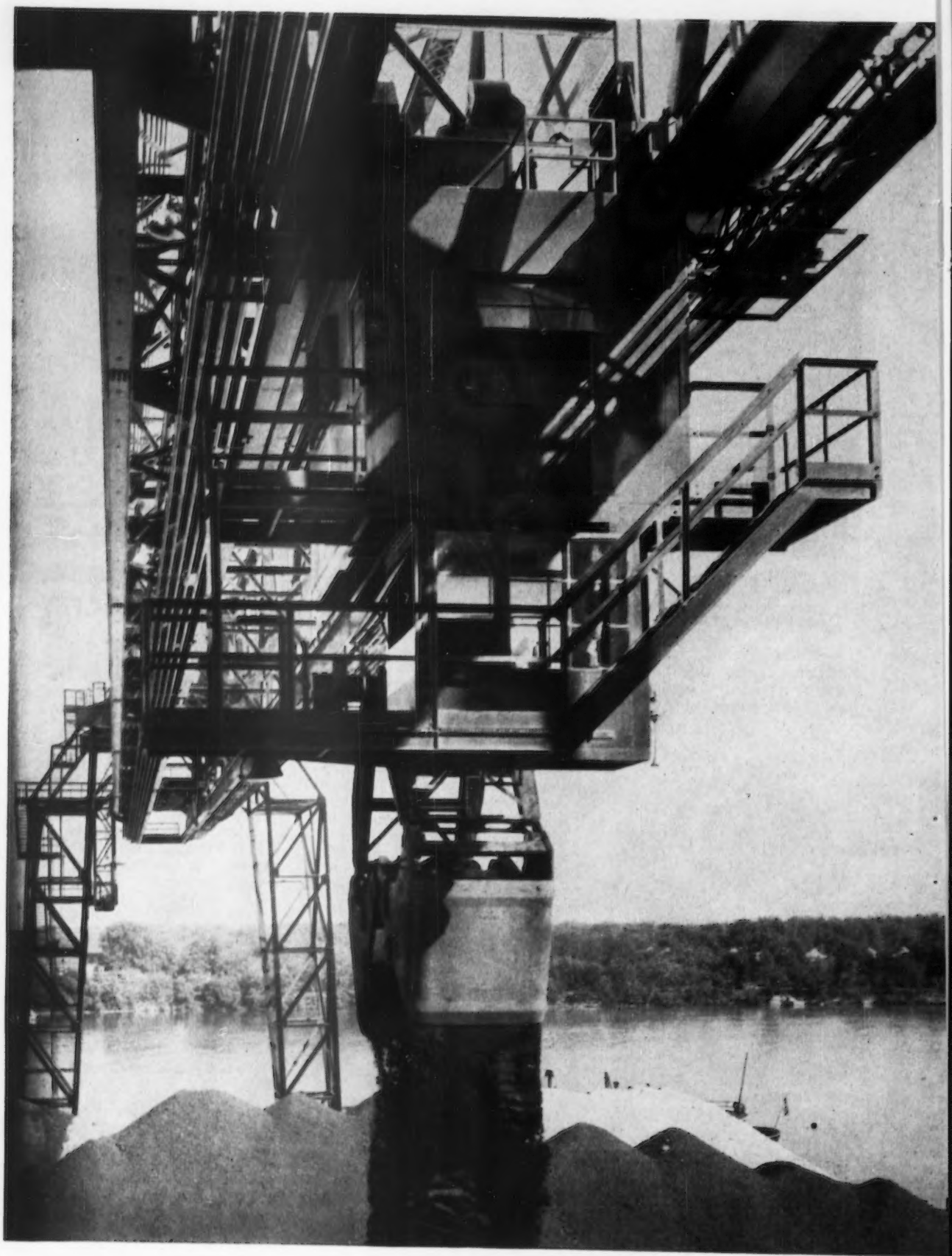
B 216



2,300,000 pounds ship-to-shore in one hour!

Westinghouse-equipped ore unloaders set new highs in speed and dependability for McLouth Steel

Power. Durability. Precision. These were the requirements for the motors and controls to operate these two 547-foot ore bridges for McLouth Steel. Westinghouse supplied the solution with rugged MC mill motors and the newest developments in automatic controls—Magamp* and Rototrol®.

In just 41 seconds, these ore bridges run a complete cycle—digging, hoisting, trolleying, dumping, rehoisting and back again for another 27,000-pound scoop.

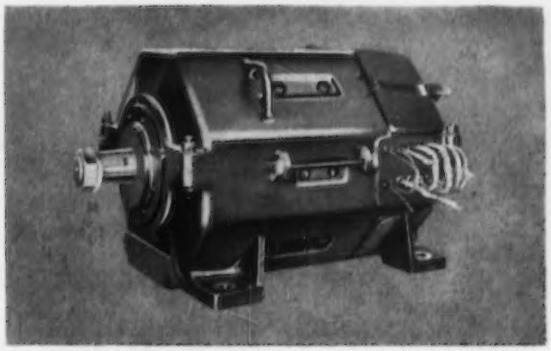
It will pay you to investigate the facts that give such outstanding results as these when you are considering motors, drives and controls. Get the details from your Westinghouse sales engineer. Or write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pennsylvania.

*Trade-Mark
J-21957

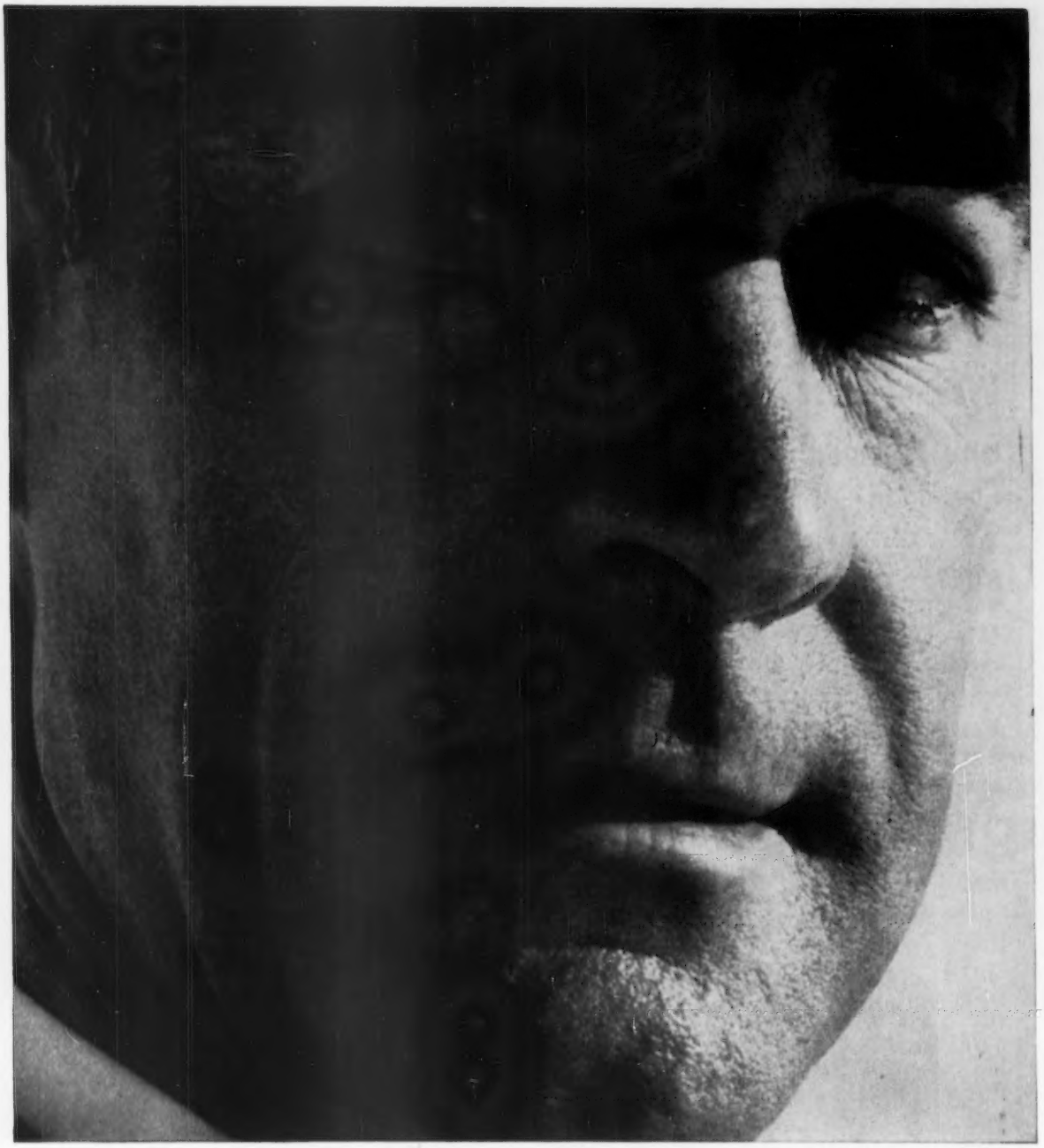
YOU CAN BE SURE...IF IT'S

Westinghouse

These two new ore bridges can unload all size boats by means of an adjustable "apron" which can be raised high enough to allow the mast of any vessel to pass underneath. Dependable Westinghouse hold-and-close motors carry the load on this modern installation.



Rated at 187½ hp, 230 v, 460 rpm, this 616 Series mill motor gives the kind of outstanding performance to meet today's tougher, faster jobs. Westinghouse engineers are ready to work with you to give you the best motors and controls for your needs.



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the Edison R-4 double-filament bulb

Working crews are assured greater underground safety, more productive man-hours because the Edison R-4 double-filament bulb is on the job.

Miners equipped with this bulb know that burn-out doesn't mean blackout. If one filament burns out, a turn of the switch transfers the power of the unfailing Edison battery to the second filament—continued, brilliant illumination is restored for the full shift. There's no lost time for the miner, or short crews for the foreman. There is only *one bulb*, located in the center of the headpiece, which gives the advantages of maximum reflector area.

This kind of reserve light protection means that hundreds of man-hours may be saved every year. The result is increased production with an added margin of safety. Our bulletin gives complete details. Write for your copy.

Edison R-4 Cap Lamp . . . ideal for self-service systems.

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Michigan Model 175A loads crushed stone into stationary hopper at end of 480-ft conveyor leading to concrete batch plant.

6,750 cu ft of concrete per hour,

from automatic batching system fed by Michigan Tractor Shovels,

paces Peter Kiewit paving crew

Peter Kiewit Sons' Company, Omaha, started construction of the new Minot (North Dakota) Air Force Base as originally planned for jet interceptors. But when the Air Force decided to base B-52-type heavy bombers there as well, a longer, wider, stronger runway became a sudden necessity. Modified plans doubled width to 300 ft, extended length well beyond the original 8100 ft. Key installation was a 50 ft ribbon of concrete, 16 inches deep, centered along the full length of the runway. To finish the greatly enlarged contract ahead of penalty date, concrete pours had to average 2,000 cubic yards per 8-hour day.

Kiewit owns 16 Michigans, two used here

Faced with this tight schedule, the Kiewit crew turned to an automatic concrete batching plant *and modern high-speed material feeding methods.* According to R. D. Wilson, Kiewit Area Manager, the *entire* paving

Normal carry position, slightly above ground level, eliminates possibility of stone-crushing dozing action; yet permits high-speed travel without spillage-loss.

operation was planned around the known productive ability of Michigan Tractor Shovels. Two of Kiewit's 16 Michigans, both big Model 175As, were brought in to feed the batching plant via mobile and stationary hoppers and automatic conveyors. Handling *3,200 tons of aggregate per day,* these 2¾ yard Michigans had to deliver heaped buckets every time—and they did! Their big loads, *delivered fast,* kept plant at peak production of 180 batches (each 37.4 cu ft) per hour, day after day . . . making the job possible—*and profitable!*

Michigans eliminate pulverizing problem

One of the major advantages of the Michigans was that, despite their speed, the big low-pressure tires compacted—but never pulverized—the stone underfoot. Thus Kiewit eliminated a major problem—the crushing and grinding of aggregates often experienced when crawlers are used. Trucks delivering the stone dumped at the edge of the air field; there the Michigans took over. These fast, highly-maneuverable units loaded the material, carried it up steep ramps to build and maintain huge stockpiles.

"Fast, dependable, easy to repair"

"Another reason we put Michigans on the job was we knew they require very little maintenance," says Paving Supt Max Woodard. "When repairs *are* necessary, excellent accessibility makes it an easy job. We've also found these machines have enough power to do anything we want. They're fast, too. Our operators like the way they handle. *We* like the way they kept those hoppers full. Fuel? One tank of diesel oil (50 gallons) keeps them going all day long! That torque converter's good and the power-shift transmission is a big improvement over other machines. Michigans have done a nice job for us."

Make this test

Chances are, Michigans can do a "nice job" for *you,* too, no matter *what* bulk materials you have to move. But there's an easy way to find out first hand! Simply ask your Michigan Distributor for a free demonstration—no obligation, of course. If what you see looks good enough to buy—and we think it will—your distributor has a wide range of purchase plans . . . including Clark's popular Lease-Purchase which lets you put one or more Michigans to work *without spending a cent of capital.*

Clean design of bucket mechanism gives operator excellent visibility when dumping into hopper.

Another of Peter Kiewit's Michigans serves as all-around handyman on company's Indiana Turnpike contract. This 102 hp 2 yd Model 125A lifts up to 11,000 lbs, carries 5,500 lbs at 4 mph.

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2465 Pipestone Road,
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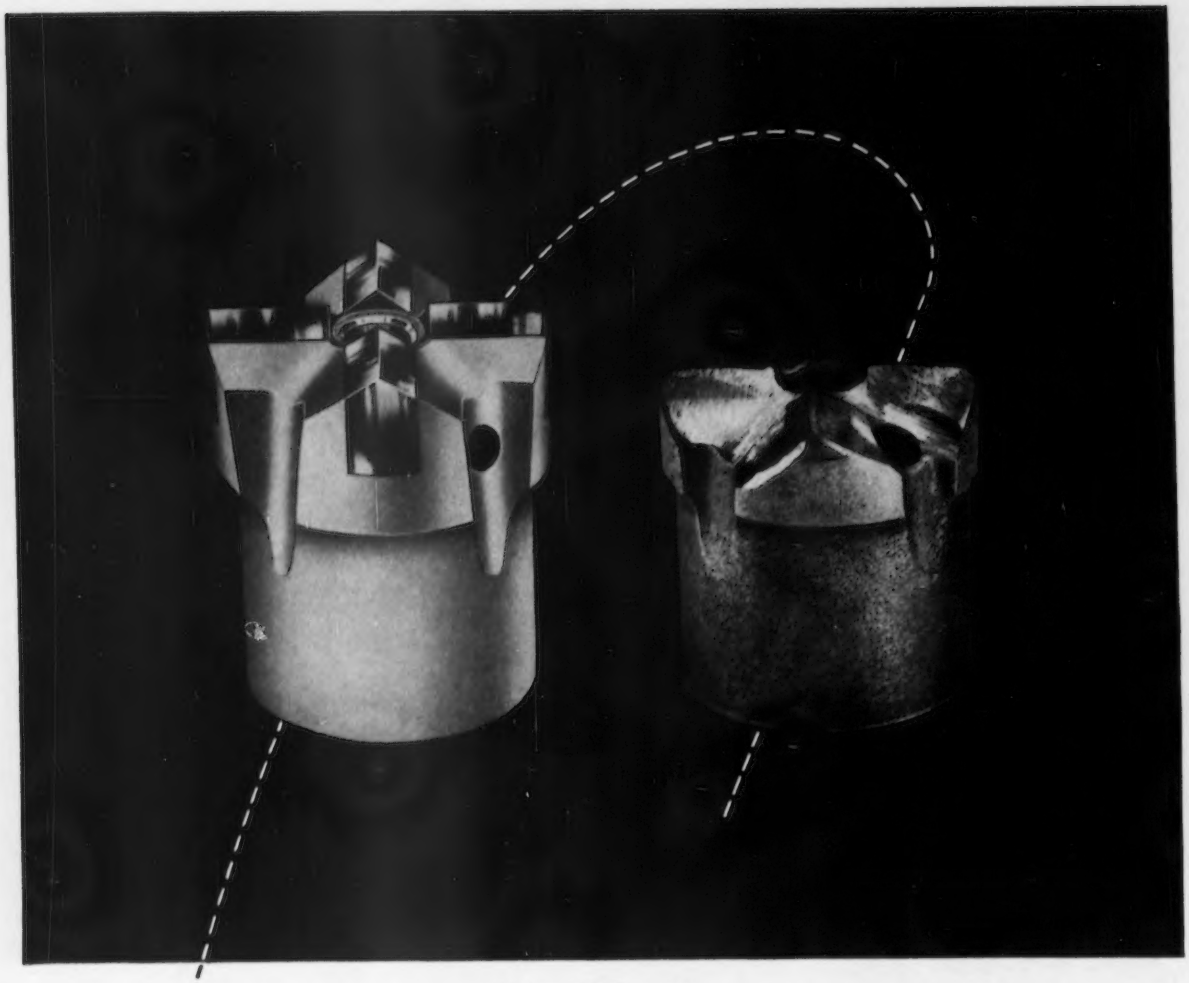
CLARK® EQUIPMENT



THIS JOY BIT DRILLED *46% Farther*... STILL MORE TO GO

YOU'LL FIND YOUR BIT SIZE IN THIS CHART

SHOULDER DRIVE	BOTTOM DRIVE	TAPER SOCKET
1½"		1¼"
1⅝"		1⅜"
1¾"		1½"
1⅞"		1⅝"
2"		
2⅛"	2⅛"	
2¼"	2¾"	
2⅜"	3"	
2½"	3¼"	
2¾"	3½"	
3"	4"	
3½"	4½"	
4"	5"	
4½"	5½"	
	6"	

Note: Shaded areas are X-Type, others are Cross Type

WRITE FOR FREE BULLETIN 172-4

Drilling Rock with a scleroscope hardness of 90-100 takes a lot out of most carbide bits . . . on this job, other bits were averaging 532 feet. Our illustration shows a Joy bit before and after drilling almost 800 feet in this formation. The average for Joy bits on the entire job was 781 feet.

Here's why: OFFSET WINGS allow drag-free rotation, faster removal of cuttings, easy reconditioning . . . DEEP SLOTTED CHIP WAYS allow cuttings to escape; bit does not regrind its own cuttings . . . INSERT STAYS IN because of new brazing method . . . SPECIAL ALLOY STEEL BODIES heat treated for shock resistance and high fatigue life . . . PRECISION MILLED THREADS instead of tapped threads.

These are the reasons why Joy tungsten carbide bits give extra footage . . . and only Joy bits have all these features. Let your Joy representative prove it to you. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW C 6595-172

JOY ... EQUIPMENT FOR MINING ... QUARRYING ... CONSTRUCTION

Portable Air Compressors

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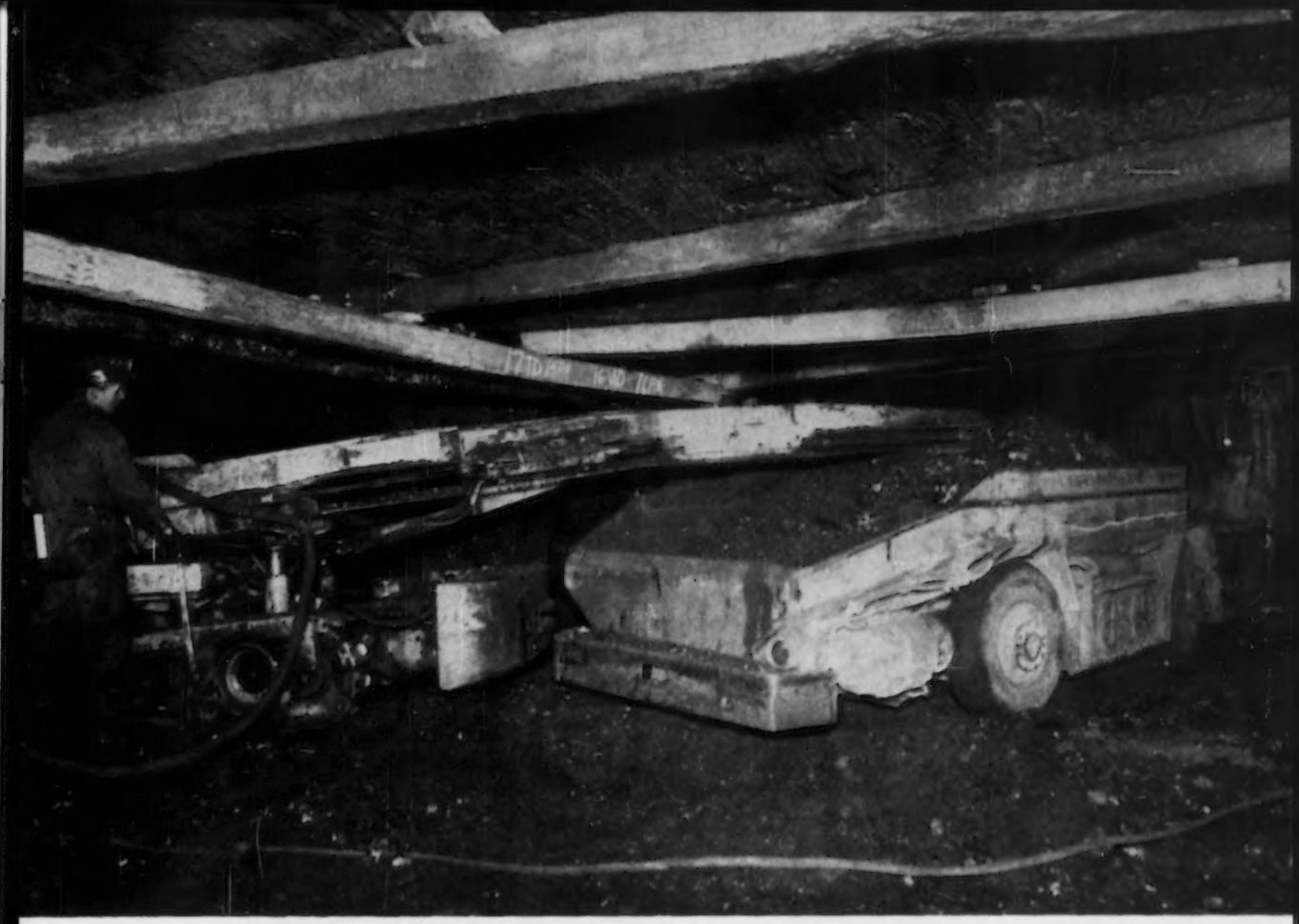
Drilling Bits

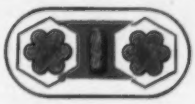
Hand-Held Rock Drills



Okocord Red Saddle shuttle car cable is the answer to:

constant flexing • run-overs • abrasion pulling • twisting

Conditions in individual mines vary. But you can be sure that you have a shuttle car cable that will resist all of these difficulties if yours is Okocord Red Saddle shuttle car cable (with Hex-Tite construction, of course).



The Red Saddle is a pre-formed neoprene protective wall which assures a uniformly thick fill between conductors . . . gives added security against short-circuiting during run-overs.

What's more, there's no danger of internal slipping or rotation with Hex-Tite construction. For the insulation of each conductor is hexagonally shaped to provide six plane surfaces which lock with the Red Saddle and Okoprene sheath. Bonding between all elements is assured by a special adhesive.

Naturally, the Okoprene sheath is tough, highly flexible and is unaffected by oils, acids, alkalies and mine water.

These features—plus others such as the heavy reinforcing cords embedded in both insulation and sheath as a further guard against pulling damage—are all good reasons why we believe Okocord Red Saddle, using the Hex-Tite construction, is your best buy in shuttle car cable.

You'll find complete information about this rugged construction in Bulletin EM-450. Write today for your copy to The Okonite Company, Passaic, N. J.

4774

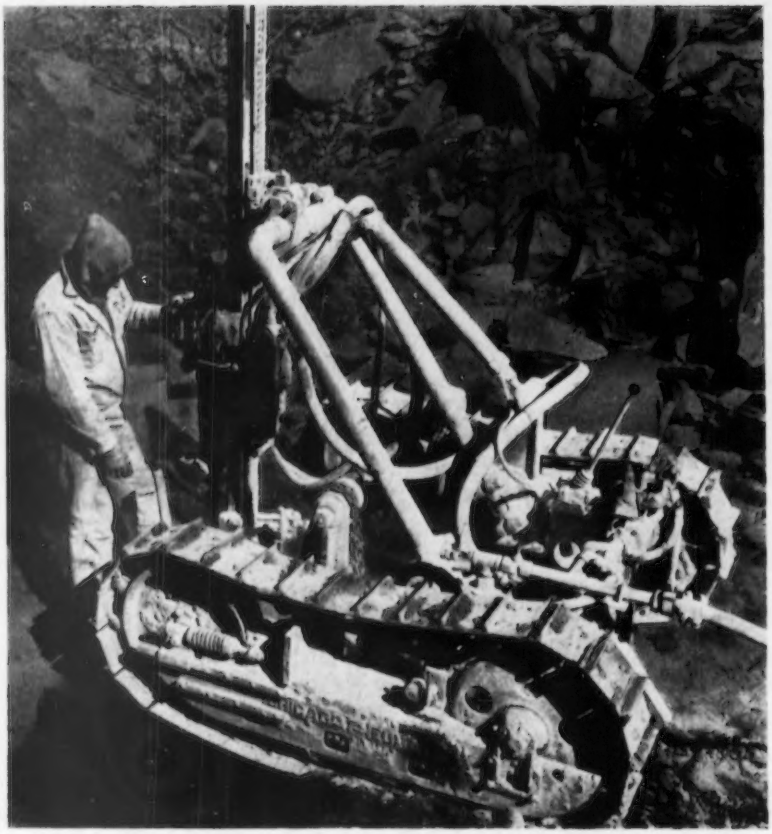
where there's electrical power... there's **OKONITE CABLE**

exploratory

CP Core Drills are designed to provide the greatest degree of versatility. Mounted on skids, they can be readily moved from one hole to another under their own power. Bolted framing permits fast knock-downs for transportation to remote sites. Available without skids for truck or jeep mounting. Air, electric, gasoline and diesel drives. Capacities: Model 8HD—1250 ft. with E-EX fittings; Model 15HD—2250 ft. with E-EX fittings.

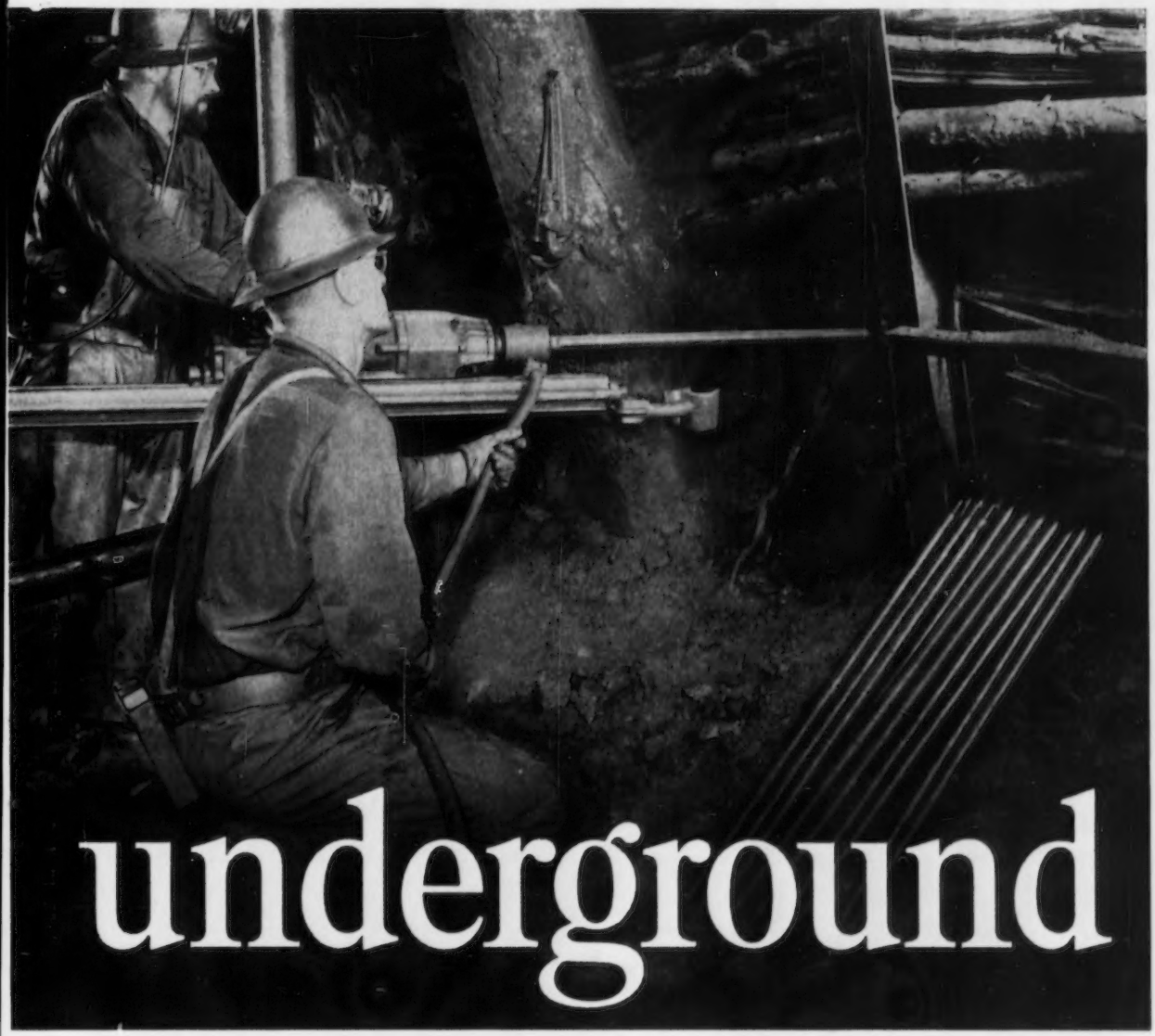
open pit

The C-800 Tracdril is a one man drilling crew that's ideal for removing overburden. Combines the drilling speed of a CP-400 heavy Drifter with the adaptability of a self-propelled track mounting. The Tracdril tows its own air supply, takes toughest terrain in stride. Uneven ground is no problem . . . the Tracdril's "knee action" tracks keep the hydraulically operated U-arm level.



The CP-555 Rotauger is perfect for drilling long blast holes in close quarters. Short in length, long on performance. The Rotauger can more than double your footage in the softer formations. Available for wet or dry drilling, drills 2½" holes at speeds up to 8 feet per minute and to depths of 100 feet.

These products are only a sample of the complete CP line of equipment for metal mining. Hydraulic Boom Arms, Stopers, Drifters, Airlegs, Pneumatic and Electric Tools, and Portable and Stationary Air Compressors are also available.



underground

THERE'S A CP DRILL TO "FILL THE BILL" IN METAL MINING

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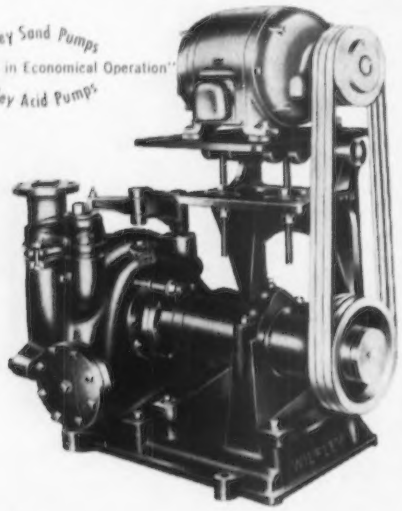
5 reasons why

WILFLEY
SAND PUMPS

provide Lower Pumping Costs per ton of material moved!

Wilfley Sand Pumps
"Companions in Economical Operation"
Wilfley Acid Pumps



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3 Quick-change features reduce maintenance cost and minimize downtime.

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ENGINEERING AND MINING JOURNAL

AUGUST 1957

A Hot-Weather Editorial

We are departing from our usual editorial style this month to set down some useful ideas picked up during a July trip to Washington, Idaho and Montana.

Family day at the smelter. The Anaconda Co. inaugurated a new plan to allow families of employees at the great metallurgical works in Anaconda, Mont., to tour plants treating copper, lead, zinc, phosphate and manganese ores. Two days were set aside for the event. Visitors were taken by bus from parking areas to plants. Routes, well marked by arrows, permitted visitors to see the operations unguided; and exhibits at strategic spots clarified flowsheets and other metallurgical processes enroute. Food and refreshments were provided for all. Booklets in color extended greetings of the management to the guests, mapped the tours, and explained plant processes. Junior members received a huge badge proclaiming them as official home safety engineers, and adults received souvenir key chains with the symbolic Anaconda copper arrow. It's a safe guess that some 6,000 residents of Montana will have a much better idea of the plant "where Dad works," and understand the kinship which they have with Anaconda in earning a better living.

Both Anaconda and COMINCO at Trail, B. C., provide regular daily guided trips through plants for tourists, and other mining companies are planning to do likewise in the Northwest.

Costs of mine plants. It's a lucky thing for the U. S. that many of the big metallurgical works such as those at Anaconda and Bunker Hill were built in the past. If they had to be replaced at current prices many of them would cost four times as much as they did twenty odd years ago. In other words, industry would not be able to replace them and sell metals at today's prices. It's not a bit too early for the tax experts of the mining industry to join with those of the steel industry to convince Congress that this country will soon be in bad shape unless depreciation provisions of tax laws are revamped. Otherwise we might easily become a have-not nation, not because of lack of minerals, but because of lack of plant to process them.

Public relations. One of the functions of an industry is to see that its case is well documented and clearly presented at Congressional hearings, etc. In the current domestic lead-zinc crisis, the Emergency Lead-Zinc Committee, under the leadership of Charles E. Schwab of Bunker Hill, has done an unusually fine job. Exhibits prepared by Mine, Mill and Smelter Workers Union also strengthened the case of the domestic industry.

By way of contrast, read the Congressional Record of June 18, 1957 for the House in which testimony on the plight of the domestic tungsten producer was reported. If the domestic tungsten producer had a case, and we believe that he did, it isn't clearly evident—in fact some very damaging statements by Representative Kirwan were allowed to stand.

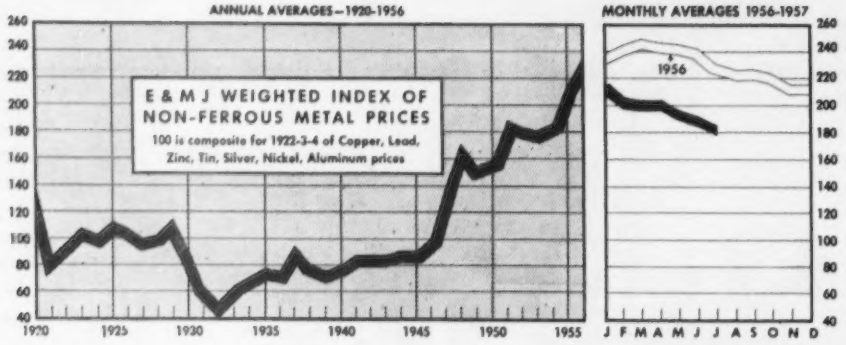
All of this points to the fact that segments of the mining industry must build bullet-proof cases before presenting them, and delegate the presentation of these cases to men skilled in the art of communications—written and oral. This is one of the highest objectives of an industry public relations program.

Barter program. It seems certain that both political parties will have to yield to some kind of farm support program to stay in office. In view of this, it might be worth the industry's time to support a more expansive plan to exchange perishable farm surpluses for imperishable metals and minerals. A well-drawn program could benefit both foreign and domestic producers, the farmer, the taxpayer, and even the metal consumer. Who else would you have to sell to get such a plan enacted into law?

Feast or famine. Mining men in the Northwest who are fed up with the cyclic swings in the metals business are going in for diversification more than ever. Sunshine Mining Co.'s successful venture into the oil industry is but one example. Other companies are studying the attractive field of reactive metals. Since the industrial wastes of one industry may become the raw materials of another, some companies are taking a serious look at the chemical processing industry.

E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1956
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES 1956-1957
1956
J F M A M J J A S O N D

MARKETS

Lower prices for copper, lead, zinc, silver and tin pushed *E&MJ's* metal price index downward from 191.42 (revised) for June to 184.30 for July. This is the lowest the index has been since May 1954. Low inventories in the hands of consumers, substantial production cutbacks by metal producers, and a resumption of industrial output after summer vacation slumps, could combine to push the index upward before many months. Increasing labor costs in the face of weakening markets will put a more positive floor on metal prices, and more precipitately than in previous years.

●

LABOR

Mine, Mill and Smelter Workers Union is shunting aside its drive for health and welfare legislation temporarily to concentrate on the current unemployment situation. The union is also urging its unemployed members to check carefully on the labor market in other areas before moving out of mining camps. Delays in unemployment compensation are involved when a miner moves from one state to another.

Bargaining rights at Consolidated Denison, which will be one of North America's uranium producers, were won by MM&SW.

●

AT HOME

Detroit Edison's fast breeder reactor at Lagoona Beach, Mich., is rated by some atomic experts as the "best bet" for the production of power.

GSA announced that it will buy the following for stockpile this year: asbestos, chromium metal, fluorspar, lead, two types of manganese, mica, selenium and zinc. Quantities have not been stipulated. Authorized items for supplemental stockpile include antimony, aluminum, bauxite, chromite, copper, fluorspar, lead, manganese, mica, paladium, selenium and zinc.

Alcoa's new powder metallurgy products represent a "major breakthrough" of the heat barrier which has barred aluminum from high-temperature applications to date. New products are available as extruded shapes, forgings, sheet, foil, fasteners and wire.

Haile Mines Inc. has entered into an agreement with Dr. M. D. Hassialis of Columbia University to develop a new process to treat low-grade refractory manganese ores.

A new electronic transmission device called the "spacistor" has been announced by Raytheon Mfg. Co. The new unit combines the best properties of the transistor and the vacuum tube. Production is three to five years away.

●

ABROAD

Low metal prices have caused the shutdown of the Volcan, Venturosa, Humaron, Santander, Yauli Mining Co. and Detacocha mining properties in Peru.

Transvaal Chamber of Mines reports tonnage of ore treated for uranium in 1956 totaled 17,967,237. Grade averaged 0.470 lb U_3O_8 per ton.

MARKETS

Metal Markets Slow; Copper, Zinc, Tin Prices Down; Aluminum Price Up

NONFERROUS METAL PRICES dropped from 191.42% of the 1922-1924 average to 184.167% in July. All major nonferrous metals were down. Copper dropped from 30.334c to 28.690c; lead from 14.32c to 14.00c; zinc from 10.86c East St. Louis to 10.005c; and tin from 98.06c to 96.538c.

The August metal price average may be higher than July owing to the lc rise in aluminum prices August 1.

Lead-zinc tariff hearings before the Senate Finance Committee showed considerable support. Doubtless all Senators from lead and zinc mining states support higher tariffs. Many observers feel there is almost no chance for the legislation passing this session. Other business is considered more pressing by most Senators and there is a move to end this session soon. There is some feeling the Administration, though sponsoring the bill, is not pressing for its passage. Some feel Dulles is reluctant to see it pass—a number of countries that are important purchasers of U. S. manufactured goods indicated great discomfort over the proposed bill.

Secretary of Agriculture Benson again said the department has no intention of liberalizing barter. In the past year $72-million of barter zinc (250,000 to 266,000 tons) and $40-million of lead (110,000 to 125,000 tons) were acquired through this program.

Copper is not headed for an upturn in the near future. Copper prices dropped owing to falling demand and increasing output. The latter has only partly been remedied while so far the former shows no signs of picking up. Stocks in the hands of U. S. fabricators remain high (see chart)—most of it has already been run through plants and is held in fabricated and semifabricated form. July vacations may reduce this. But refined copper deliveries to fabricators may also be low; producer stocks may rise further.

Production cuts will continue to be a major topic of conversation. Many believe the Chilean companies are cutting output but the political situation will not permit an announcement. The higher the output of copper in Chile the lower the tax rate. The base tax rate is 50% of profits. When output is 170,000 tons at Chile Exploration, 47,000 at Andes and 151,000 at Braden, an additional tax of 25% is added. If the output drops to 80% of these figures, the tax is raised to 80% of profits. As production rises for any of the three companies, the tax diminishes and when the above figures are doubled, only the 50% tax remains. The Chilean government's Copper Department actually decides the amount to be produced; recently it was proposed to the Copper Department that output be cut. So far no answer has been announced.

Rhodesian mines late in July were struck by European miners' unions. The origin of the strike was the demand by the rockbreakers that they work six rather than eight hours on Saturdays. The strikers say they will accept the decision of a government commission. The companies, some suggest, have indicated little inclination to make concessions. But the copper market has not significantly firmed possibly because of the view the copper will not be missed but probably owing to the notion such a small issue could not keep the mines closed for long. (The strike ended after about 5 days.)

Copper prices dropped in July. Katanga's price went down about 0.9c to 27.7c in Europe. Custom smelters dropped to 28¼c early in the month. London prompt copper bid rose about ½c owing to short covering when the Rhodesian strike occurred—it dropped back later.

Katanga formerly quoted a N. Y. price less than its European price by the transport cost to the U. S. As of August 1, the prices will be the same.

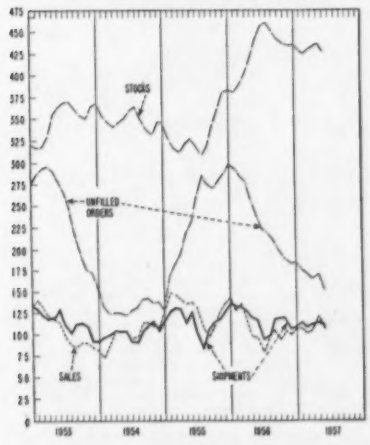
Change in copper deliveries to the U.S. Government this summer is uncertain. Deliveries have averaged about 5,000 tpm; of this about 3,400 were scheduled on fixed price contracts—either regular stockpiling or DMPA contracts. The latter go into the stockpile periodically. The remaining 1,600 tpm was copper owed the Government—it had been deferred to industry during the period of shortage. About 2,400 tons of the 3,400 tpm was on contracts that were to terminate in June of this year. Nearly all of the remaining 1,000 tons is International Nickel copper. But a third group of contracts—capacity expansion contracts—with fixed prices plus escalation may take over. White Pine and Calumet & Hecla can probably get about 29c for about 4,000 tpm (mainly White Pine) and San Manuel about 27c for about 6,000 tpm. The former could more than offset the decline in the other deliveries (see *Metal & Mineral Markets*, July 4, 1957, p. 7).

Aluminum primary pig prices rose 1c, just 4%, August 1; the occasion for the increase was the rise in wage rates (discussed here in July). Alcan has sold in the U. S. at the same price to customers (includes the import duty) as U. S. producers and doubtless will also raise. Alcoa recently said it is guaranteeing 99½% pig. Alcan has been doing this all along and Anaconda has been supplying only this grade. Probably all producers could absorb in their own fabricating any below this grade. The U. S. market has not strengthened significantly.

Zinc prices were cut July 1 by a major custom smelter to 10c East St. Louis and 10½c delivered. One other smelter immediately followed. But a few small sales were made at the old price on July 1 and 2. Various zinc firms cut output further. The Government said it would continue domestic stockpiling—some observers thought it might end with the end of the fiscal year in June 1957. In the past month it probably took about 11,000 tons—this is about 25% of domestic mine output.

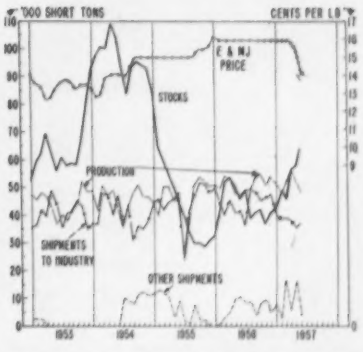
Lead remained at 14c N. Y. through July. Sales were about the same as in June. American Bureau of Metal Statistics for June showed stocks in the U. S. up about 6,800 tons to 64,861, shipments to U. S. users up about 2,000 tons to 37,257, output down about 3,500 tons to 48,203 and other shipments (apparently U. S. Government) down to 4,120 tons from 15,743. This drop probably reflects the near end of barter.

U. S. Copper Fabricator Data



U. S. Copper Association data, thousands of short tons, through June. Sales and shipments are for fabricated products (as are unfilled orders) and are two month moving averages.

Primary Refined Lead Data



Data, except price, from the American Bureau of Metal Statistics. "Other Shipments" refers to shipments to the U. S. Government. The price is the *E&MJ* weighted average, N. Y. Data through June; price through July.

MARKETS (*Continued*)

Average Prices July (*E&MJ* Quotations)

Copper:	
Electrolytic, domestic refinery	28.690
Electrolytic, export refinery	26.727
Lead:	
Common, New York	14.000
Common, St. Louis	13.800
Silver and sterling exchange:	
Silver, New York, per oz.	90.280
Silver, London, pence per oz.	78.125
Sterling Exchange	278.783
Zinc:	
Prime Western, East St. Louis	10.005
Prime, Western, delivered (g)	10.505
Tin:	
New York Straits	96.538
Gold per oz. U. S. price	$35.000
Quicksilver, per flask	$254.308
Antimony, (E&MJ)(d)	36.590
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$91.077
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	27.100
Magnesium, ingot	35.250
Nickel (f)	74.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(e) Tin content.

(f) Contract price, f.o.b. Port Colborne, U.S. duty included. Other regular sellers 78¼¢ to $1.25.

(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

July trading declined 9½%. Bar prices remained steady; coins were 1 to 2% lower. The Soviets announced plans for increased gold production at lower costs. European turnovers showed Paris leading. Swiss dealings were active, Asiatic transactions increased. South American markets were quiet with Brazil again listing the world's lowest gold price, $33.25 per oz. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 kg)	
	June 30	July 31	June 30	July 31
NEW YORK, transit	.....	.....	$35.08	$35.08
MANILA	$43.75	$43.25	36.20	36.30
HONG KONG	44.60	45.00	38.10	38.00
BOMBAY	55.75	56.80	54.75	54.50
TANGIER	42.90	42.65	34.90	34.90
BEIRUT	43.00	43.00	35.15	35.13
PARIS	44.50	44.75	36.20	36.90
BUENOS AIRES	39.25	38.15	35.15	35.40

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

July 1957	Electrolytic Copper (a) Domestic	Copper (b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
1	28.825	26.425	14.000	13.800	10.579	10.079	25.000	97.500
2	28.825	26.675	14.000	13.800	10.549	10.049	25.000	97.750
3	28.800	26.250	14.000	13.800	10.500	10.000	25.000	97.875
4	Holiday	27.100	Holiday					
5	28.825	27.350	14.000	13.800	10.500	10.000	25.000	97.625
6	No Market	27.350	14.000	13.800	10.500	10.000	25.000	97.625
8	28.775	27.275	14.000	13.800	10.500	10.000	25.000	97.375
9	28.775	27.100	14.000	13.800	10.500	10.000	25.000	97.250
10	28.775	27.350	14.000	13.800	10.500	10.000	25.000	96.750
11	28.825	26.900	14.000	13.800	10.500	10.000	25.000	96.875
12	28.825	26.650	14.000	13.800	10.500	10.000	25.000	96.625
13	No Market	26.650	14.000	13.800	10.500	10.000	25.000	96.625
15	28.800	26.525	14.000	13.800	10.500	10.000	25.000	96.000
16	28.725	26.975	14.000	13.800	10.500	10.000	25.000	95.625
17	28.750	26.900	14.000	13.800	10.500	10.000	25.000	96.000
18	28.600	26.425	14.000	13.800	10.500	10.000	25.000	96.250
19	28.600	26.450	14.000	13.800	10.500	10.000	25.000	96.250
20	No Market	26.450	14.000	13.800	10.500	10.000	25.000	96.250
22	28.575	26.475	14.000	13.800	10.500	10.000	25.000	96.000
23	28.525	26.700	14.000	13.800	10.500	10.000	25.000	95.875
24	28.600	26.775	14.000	13.800	10.500	10.000	25.000	96.000
25	28.700	26.500	14.000	13.800	10.500	10.000	25.000	96.500
26	28.450	26.575	14.000	13.800	10.500	10.000	25.000	96.125
27	No Market	26.575	14.000	13.800	10.500	10.000	25.000	96.125
29	28.525	26.500	14.000	13.800	10.500	10.000	25.000	95.875
30	28.550	26.375	14.000	13.800	10.500	10.000	25.000	95.625
31	28.525	26.350	14.000	13.800	10.500	10.000	25.000	95.625
AVERAGES FOR MONTH								
July	28.690	26.727	14.000	13.800	10.505	10.005	25.000	96.538
AVERAGES FOR WEEK								
July								
3	28.820	27.021	14.000	13.800	10.771	10.271	25.000	97.438
10	28.788	27.254	14.000	13.800	10.500	10.000	25.000	97.325
17	28.785	26.767	14.000	13.800	10.500	10.000	25.000	96.292
24	28.580	26.546	14.000	13.800	10.500	10.000	25.000	96.104
31	28.550	26.479	14.000	13.800	10.500	10.000	25.000	95.979
CALENDAR WEEK AVERAGES								
July								
6	28.819	26.858	14.000	13.800	10.526	10.026	25.000	97.675
13	28.795	26.988	14.000	13.800	10.500	10.000	25.000	96.917
20	28.695	26.621	14.000	13.800	10.500	10.000	25.000	96.063
27	28.570	26.600	14.000	13.800	10.500	10.000	25.000	96.104

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

July 1957	Silver (c) New York	Silver London	Sterling Exchange	Gold London	Gold (d) United States
1	90.250	78.125d.	279.1562	250s. 8½d.	$35.00
2	90.250	78.125d.	279.1718	250s. 7¾d.	35.00
3	90.250	78.125d.	279.1250	250s. 7½d.	35.00
4	Holiday	78.125d.	Holiday	250s. 8½d.	Holiday
5	Holiday	78.125d.	279.1250	250s. 7¾d.	35.00
6	(e)	(e)	(e)	(e)	35.00
8	90.250	78.125d.	279.1375	250s. 8d.	35.00
9	90.250	78.125d.	279.1125	250s. 8¾d.	35.00
10	90.250	78.125d.	279.0625	250s. 9¼d.	35.00
11	90.250	78.125d.	278.9375	250s. 9¾d.	35.00
12	90.250	78.125d.	278.6562	250s. 11¼d.	35.00
13	(e)	(e)	(e)	(e)	35.00
15	90.250	78.125d.	278.7937	251s. 1d.	35.00
16	90.250	78.125d.	278.8312	250s. 11¼d.	35.00
17	90.250	78.125d.	278.6875	251s. ¼d.	35.00
18	90.250	78.125d.	278.6687	251s. 2d.	35.00
19	90.250	78.125d.	278.6375	251s. 1¾d.	35.00
20	(e)	(e)	(e)	(e)	35.00
22	90.250	78.125d.	278.6875	251s. 2¼d.	35.00
23	90.250	78.125d.	278.5625	251s. 2d.	35.00
24	90.250	78.125d.	278.5312	251s. 3d.	35.00
25	90.250	78.125d.	278.4875	251s. 4d.	35.00
26	90.250	78.125d.	278.3750	251s. 5d.	35.00
27	(e)	(e)	(e)	(e)	35.00
29	90.250	78.125d.	278.5000	251s. 4¼d.	35.00
30	90.250	78.125d.	278.5000	251s. 3¾d.	35.00
31	90.875	78.125d.	278.4687	251s. 4¼d.	35.00
AVERAGES FOR MONTH					
July	90.280	78.125d.	278.783	—	$35.00
AVERAGES FOR WEEK					
July					
3	90.250	—	279.153	—	$35.00
10	90.250	—	279.109	—	35.00
17	90.250	—	278.781	—	35.00
24	90.250	—	278.617	—	35.00
31	90.375	—	—	—	35.00

Calendar Week Averages: New York Silver: July 6th, 90.250; 13th, 90.250; 20th, 90.250; 27th, 90.250.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent. Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotion.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

July	COPPER Cash Bid	Cash Asked	3 Mo. Bid	3 Mo. Asked	LEAD Current Month Bid	Current Month Asked	3 Mo. Bid	3 Mo. Asked	ZINC Current Month Bid	Current Month Asked	3 Mo. Bid	3 Mo. Asked	TIN Cash Bid	Cash Asked	3 Mo. Bid	3 Mo. Asked
1	215¾	216	217	217¼	90	90½	90½	90¾	74½	74¾	73¼	73½	762	762½	758½	759
2	213½	213¾	214¼	214½	89¼	89½	89½	89¾	73	73½	72¼	72½	764	765	759	759½
3	220½	221	221	221½	91	91¼	91	91¼	76½	77	74¾	75	768	769	763	763½
4	222½	222¾	223	223½	91	91¼	91¼	91½	77	77½	75	75¼	764	766	760	761
5	220¾	221	221½	222	90¾	91	91	91¼	76¼	76½	74¼	74½	762	763	758	758½
8	220½	221	221½	221¾	91	91¼	91¼	91½	76½	76¾	74½	74¾	760	761	757	758
9	222	222¼	222¾	223	91¾	92	92	92¼	77¾	78	75¼	75½	759	760	757	757½
10	218¾	219	220¾	221	90½	91	91	91¼	76¾	77	74	74¼	755	757	753½	754
11	216¾	217	219	219¼	90¾	91	91	91¼	76	76½	73¾	74¼	753	754	751	752
12	215	215½	217¼	217½	90	90¼	90¾	91	77¼	77½	73¾	74	753	754	750	751
15	216¾	217¼	218½	219	88¾	89	90¼	90½	75½	75¾	72½	72¾	748	750	746	747
16	214¾	215	217	217½	89¼	89½	90	90¼	73¾	74¼	72½	72¾	745	746	742½	743
17	215¼	215½	217¾	218	89	89¼	90¼	90½	73¾	74	72½	72¾	747	748	744½	745
18	215	215¼	217¼	217½	89¼	89½	90	90¼	73	73½	72¼	72½	746	747	744	745
19	214¾	215¼	217¾	218	89¼	89½	90¼	90½	73¾	74	73	73¼	747	748	745	745½
22	218¾	219	221½	222	89¾	90	90¾	91	74½	74¾	73¼	73¾	748	749	744½	745½
23	219	220	222¼	222½	90½	91	91½	91¾	74¾	75¼	74¼	74½	746	747	744	745
24	216¾	217	219½	219¾	90	90½	91	91¼	74	74¼	73½	73¾	746½	747	743½	744½
25	217	217½	219¾	220¼	92½	92¾	93¼	93½	75¼	75½	74¼	74½	749	750	746	747
26	219¼	219¾	222¼	222½	92¼	92½	92¾	93	75¼	75½	74½	74¾	751	752	747½	748
29	218½	219	221½	222	91¾	92	92½	92¾	74	74½	74¾	74	746½	747	744¾	745
30	214¼	215	217½	218	91¼	91½	92	92¼	73½	73¾	73¼	73½	744	745	743	743½
31	213	213¼	216	216¼	91½	91¾	92	92¼	72¾	72¾	72¾	73	746	746½	743½	744⅜
Av'g's	£217.549		£219.587		£90.614		£91.247		£75.162		£73.745		£753.130		£750.174	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98¾ and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted. St—short ton; lt—ong ton.

MISCELLANEOUS METALS

July 31, 1957

Aluminum ingot, 99 plus % lb.			27.1¢
Antimony, spot, lb. less than carload, in cases			36.59¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb.			$2.25
Cadmium, commercial sticks, delivered, lb.			$1.70
Calcium, lb. ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb. contract del.			$1.29
Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957			$2.00
Germanium, per gram, 10,000 gram lots		(c)38¢@	(d)45½¢
Indium, troy oz.			$2.25
Lithium, lb. 98%		$11.00 @	$14.00
Nickel, cathodes, lb. (a)			74¢
Other sales, reg. sellers		88¼¢ @	$1.05
Sales by dealers, etc.			$1.05
Magnesium, 99.8% carloads, lb. producer's plants, Velasco, Texas, eff. Apr. 16			35¼¢
Palladium, troy oz.		$21.00 @	$22.50
Platinum (wholesale lots), troy oz.		$83 @	$87
Quicksilver, flask of 76 lb., 25 flasks or more		$252 @	$255
Selenium, 99 plus %, lb. (May 28, 1957)			$10.50
Silicon, minimum 97%, carloads, lb.			20¢
Semi-Conductor grade, lb.			$350
Tellurium, lb.			$1.65
Thallium, 100 lb. or more, lb.			$12.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb.			(b)$2.25

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective June 3, 1957.
(c) Delivered; (d) f.o.b. plant

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$37.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$30	@	$30.50
48% Cr_2O_3 3 to 1 ratio	$52	@	$59.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$11.85(e)
Mesabi bessemer			$11.60(e)
Mesabi, non-bessemer			$11.45(e)
Lead (Galena), 80%, Joplin, Mo., ton			$170.52
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included, $1.45 @ $1.49; both duties excluded, $1.315 @ $1.355. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.18	@	$1.23
Columbium-Tantalum, per lb., combined oxides 10 to 1 ratio	$1.35	@	$1.40
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$13.50	@	$15.75
U. S. mined concentrate, per stu, f.o.b. mill (GSA price) (Suspended)			$55
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton			$56

(a) Nominal.
(e) Eff. 1957 shipping season.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, per lb. eff. Dec. 1, '56	$1.52	@	$1.55
Copper Sulphate, 100 lb. eff. Oct. 25, '56			$13.90
Germanium Oxide, gram			27½¢
Molybdic trioxide, technical, per lb of Mo	$1.38	@	$1.41

ALLOYS

Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C)			27¾¢
Ferromanganese, 74 to 76%, per lb., shipg. pt.			12¾¢
Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained	$1.68	@	$1.74
Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57)			13¢
Ferrotungsten, 72 to 82%, lb. of W contained			$2.60
Ferrovanadium, per lb. of V delivered	$3.20	@	$3.40
Silicomanganese, max. 1½% carbon, lb., contracts			12.8¢
Spiegeleisen, per long ton, 19 @ 21% grade eff. Jan. 7			$102.50

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$1,400	@	$1,725
Crude No. 2	$750	@	$1,100
Spinning fibers	$350	@	$650
Shingle fibers	$190	@	$210
Paper stock	$114	@	$137
Waste	$82	@	$84
Shorts	$28	@	$75
Asbestos, f.o.b., Vancouver, B. C. (U. S. funds):			
Spinning fibers	$470	@	$750
Shingle fibers, effective Jan. 1	$210	@	$310
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353	@	$383
Shingle stock	$172	@	$190
Paper stock	$114	@	$145
Waste, stucco or plaster			$82
Refuse or Shorts	$39	@	$72
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton	$16	@	$18
Crude oil well grade, min. 4.3% sp. gravity, at (a)			$18
Imported, c.i.f. Gulf Ports, at	$16	@	$18
Bauxite, long ton, f.o.b. point of shipment:			
Domestic, crude, 50 to 52% (not dried)	(a)$ 5.00	@	$5.50
Domestic, chemical, 55 to 58%	(a)$ 8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(a)$18.00	@	$18.50
Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade			$7.14
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.50
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$37	@	$41
60% effective CaF_2	$33	@	$36.50
Acid 97% concentrate, bulk, ton (eff. 12-1-56)			$50.00
Some sales at			$55
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$46

Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $25 and up.

Ocher, Georgia, ton, in sacks	$26.50	@	$32.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, per lt, f.o.b. U. S. mines: bright			$26.50
dark			$25.50
Mexican, for use in Mexico, per lt, f.o.b. mines, 280 to 395 pesos, depending on use	$22.40	@	$31.60
For export f.o.b. vessel, dep. on grade	$24	@	$26
Talc, f.o.b. works, ton:			
New York, purified	$18.00	@	$20.00
Vermont, extra white			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a)Some restricted sales at $11.50. (b) Corrected.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$67.00
Steel, f.o.b. Pittsburgh, billets, net ton			$77.50
Structural shapes, Pa., Ala., etc., 100 lb.	$5.10	@	$5.275

THIS MONTH IN MINING

OPEN PIT floor is in uranium ore at Lucky Mc's property in the Gas Hills District of Wyoming. Mine will supply planned mill.

Lucky Mc, Phelps Dodge Plan Expanded Mill

LUCKY MC URANIUM CORP. and Phelps Dodge Corp., third largest copper producer in the United States, have joined in proposal to AEC to add 1,000 tpd to capacity of the Lucky Mc uranium mill at Gas Hills district, Fremont County, Wyo.

Allen D. Christensen, Lucky Mc president and head of Utah Construction Co., world-wide mining and engineering firm which controls the uranium concern, made the announcement.

He said that Phelps Dodge would acquire a 30% interest in the 1,000 tons of added capacity if approved by the Commission.

An authorized 750 tpd columnar ion exchange mill is now under construction in the district by Lucky Mc. Thus if AEC approves the new proposal, the mill would have daily rated ore feed of 1,750 tons—one of the largest in the domestic industry.

A uranium affiliate of Phelps Dodge would be given contract to ship 300 tpd of ore to the expanded mill.

The proposal also sets aside an additional 400 tons of the new capacity for custom shippers. Lucky Mc would be allocated another 300 tons. As the present mill contract calls for 300 tpd custom capacity out of the 750 tons rating, total custom capacity of the expanded mill would be 700 tons.

Phelps Dodge would not acquire any stock interest in Lucky Mc or any interest whatsoever in the existing mill. The manner in which the copper firm would obtain a "30% interest" in the proposed expansion is a "complicated one", officials said. This phase of the announcement created great interest in legal circles of the mining industry.

Mr. Christensen said that the new proposal supplants one now pending in negotiation form before the AEC's Grand Junction Operations Office in which Lucky Mc solely sought a 635 tpd expansion.

The announcement follows completion of 51% options by Phelps Dodge in connection with its Gas Hills district Wyoming Uranium Corp joint venture. That deal calls for creation of a uranium subsidiary which would ship to the expanded mill.

Because of its liberal custom treatment phases, the new Lucky Mc-Phelps Dodge proposal is thought to strengthen chances of the two firms of receiving favorable consideration from the Commission.

While there has been considerable publicity about various mills to be built or expanded in the Crooks Gap-Gas Hills area, AEC said at Grand Junction there actually were only two proposals before it at this time.

They include the earlier 635 ton expansion of Lucky Mc and a proposal of the Fremont Minerals Co. to build a 750 tpd mill at Riverton, 52 miles west of the Gas Hills open cut mines.

Fremont is a subsidiary of Susquehanna Corp., which firm also controls Mines Development Co., now operating a mill at Edgemont, S. D.

Cross examination of a Commission spokesman failed to disclose any knowledge of large reserves of uranium controlled by Susquehanna or affiliates in the district.

Globe Mining Co. in which Jenkins and Hand, Casper oil operator, have holdings, has "announced" plans to build a mill in the district. And it is reported generally that Union Carbide Nuclear has some interest in this venture. However, Globe has not submitted any proposal as yet to AEC.

Western Nuclear, which firm has a 400 tpd mill at the Crooks Gap district, also has made announcement about expansion plans. However, this firm has not submitted a proposal.

Mr. Christensen said that the 1,000 ton addition would be made through installation of another, single, large, ion-exchange unit.

He also announced that stripping of overburden at the main pit on Lucky Mc claims had now reached the ore.

It is estimated that the 1,000 tpd addition to Lucky Mc mill would bring total cost of the project to around $12-million.

The 750 tpd unit originally was estimated to cost $6.9-million. No official figure was released on the cost of the expansion.

Automated Mill Planned For Homestake-Partners

HOMESTAKE NEW MEXICO PARTNERS plans the most completely-automated mill in the domestic uranium industry, it was announced at Salt Lake City.

Carl M. Marquardt, president of Industrial Physics and Electronics Co., said his concern had been given contract by Homestake to perfect the automation of the 850 tpd mill to be located at Grants, N. M. in the Ambrosia Lake district.

Marquardt said that the mill, as now planned, would have at least 10 complete control systems. These will be con-

nected to a central control room with a number of panels.

Here a single operator will be able to observe and if necessary correct a series of processes starting with crushing and ending with the control of amount of water in the tailings. An important factor in operations in this arid district is water.

Marquardt said among the control systems will be a specific gravity meter and a temperature meter in the pachuca tanks where the uranium pulps are subjected to air agitation under high temperatures.

Sodium hydroxide precipitation will be control systematized, as will be flow through the ball mill-classifier units.

The Salt Laker said that in all, only seven men would be employed on the day shift and five men each on the other two shifts.

Thus total operating employment would be no "more than 17 or 18 men." He believes a comparable-sized mill on the Colorado Plateau would employ up to 100 men on operating shifts.

The 17-18 operators do not include service and maintenance crews, Marquardt added.

Mining Calendar

New Mexico Geological Society eighth annual field conference. Durango-Silverton-Ouray area of Colorado. Mrs. Marion Burks, Box 652, Socorro, N.M. Sept. 5-7

American Mining Congress, 1957 Metal Mining and Industrial Metals Convention, Salt Lake City. Sept. 9-12

International Mineral Dressing Congress, Stockholm, Sweden. Sept. 18-21

Exploration Drilling Symposium, University of Minnesota, Minneapolis, Minn. Oct. 3-5

Society of Mining Engineers annual meeting and Southeastern States Mining Conference, AIME. Hotel Hillsboro and Hotel Tampa Terrace, Tampa, Fla. Oct. 15-18

Professional Engineers of Oregon, state convention, Eugene, Ore., Oct. 18-19

45th Annual National Safety Congress and Exposition, Chicago, Ill., Oct. 21-25

Rocky Mountain Minerals Conference, AIME, Denver, Colo., Oct. 30-Nov. 1

American Society for Metals, second world metallurgical congress. Chicago, Ill. Nov. 2-8

Institute of Metals (London) inaugural meeting of powder metallurgy group. Church House, London. Dec. 4

Atomic Fuel Quota

NUCLEAR FUEL available to atomic plants in and out of the U. S. has been raised from its originally announced level by 59,800 kg to a total of 100,000 kg, the White House announced. Fuel is leased to domestic producers and sold or leased to foreign producers.

As We Went to Press . . .

Money for Majdanpek has at long last been negotiated by the Yugoslav government. The Balkan nation has been trying to get financing for the low grade copper property for many years (*E&MJ*, August 1956, p 86).

Officials in the Tito government have announced that France has granted a long-term credit for $40-million, and U. S. has signed for $15-million at 5% interest. Mining will be by open pit.

In lead-zinc testimony before the Senate Finance Committee, the industry was described as "just about ready to throw in the sponge" by Sen. Arthur V. Watkins (R.-Utah), who would like the tariff on pig lead raised by about 2c per lb and on slab zinc by about 1.3c.

A new mill in the Gas Hills to handle output from a 1-million-ton orebody is being planned by Globe Mining Co. and Union Carbide Nuclear. Announcement of the planned $7-million establishment was made by Sen. Frank Barrett (R.-Wyo.). No formal application has been filed at the Grand Junction Office of AEC.

The 1-million ton orebody is owned by Globe.

Construction of a $22-million copper refinery will be underway almost immediately at Chicoutimi, Que. Permit for the construction was issued in late July by the city of Chicoutimi to Clyde Lendrum, manager of Eastern Mining and Smelting Ltd. Foundations for the plant are in and completion is scheduled for July 1958.

Casper, Wyo. is going to be "clear up to here" in sulphuric acid when current project plans of Davison Chemical Co. and Platte Chemical Co. get rolling.

Platte announced a $2.5-million plant in late June for the site and now Davison, a subsidiary of W. R. Grace & Co., is considering a $2-million, 200-tpd facility for the same area, the latter to be located near the Standard Oil refinery.

Molten sulphur for the Davison plant will be trucked from the Worland-Elk basin in northwestern Wyoming. Construction should be starting late this month.

Steep Rock Iron Mines, Ltd. is going after the high-grade previously lost in waste. The mine is constructing a new concentrator to handle some 750,000 tons of crude material during each shipping season.

Mauricio Hochschild & Cia. has inaugurated the new concentrator at Condoroma mine, Peru. Condoroma, with the neighboring Kata mine, has a reported 300,000 tons of lead-zinc-silver ore.

New unit matches another 100-ton concentrator which went into operation in November 1956.

Colorado State Bureau of Mines, for the first time including uranium production in its annual report, estimated value of U_3O_8 mined in the state in 1956 at $124.5-million. Total value of mineral output, including petroleum, was placed at $406-million.

Higher grade uranium found at Narssaq this summer has boosted Greenland's hopes for an economic industry, according to Dr. Niels Bohr.

Behind the By-Lines...

G. P. Lutjen

Nickel is one of today's most exciting metals, a fact which the folks at International Nickel have been telling us for some time. Now security analysts make it official by regular issuance of communiques on the subject from their Wall Street retreats. By and large their semi-confidential memoranda reflect a bullishness but there remain those who say there's plenty of nickel and that the apparent shortage is a temporary mirage.

Along has come Henry Lytton who has taken a long, hard look at nickel supply and demand right through 1975 and his findings are laid forth on p 86 of this issue. We don't want to tip Mr. Lytton's hand here, so we'll say no more.

Mr. Lytton is a business consultant who has spent a lot of time in Washington working out programs in the Government for the handling of mineral commodities. His extensive nickel study was the basis for his master's thesis, a degree he received from New York University this year. For *E&MJ*, Mr. Lytton streamlined the main findings set forth in his thesis, to give you a quick, easy to read blueprint of the nickel situation for the next twenty years. For your own amusement and edification you can apply his formula which he explains and become your own nickel prognosticator.

A "nuts and bolts" article is one that deals with some of the everyday tools, parts or supplies that we so often take for granted. There are two purposes in publishing a nuts and bolts article. One is to offer the reader a refresher in the subject, pointing out some facts that he may have forgotten or is overlooking. The other aim is to provide him with material that will help the miner or mechanic in his mine or shop; particularly the apprentice or younger man on the job.

In this issue we've got two such "nuts and bolts" articles which serve both purposes admirably. In both cases we bring the know-how from the people who best know how, the manufacturer. On p 96 is a refresher on valves, their selection, installation and maintenance. Then on p 83 there is a fast run down on how to spot trouble in your bearings—what causes the trouble and what to do about it.

We think you'll find both articles interesting and useful and if we may, we'd like to suggest passing them along to your valve and bearing people.

Mining in Western movies is a strange and wonderful thing and there may be lessons in it for all of us—but we doubt it. Admittedly, mining usually has a minor role in the Western. As a matter of fact in 8 out of 10 horse operas a mine's sole purpose is to get the cowboys off their horses and out of the sun. There are times though when a mine supplies an alternate method for doing in the villain such as clobbering him with a ton or so of loose. Then too, as a means of placing the hero in a tough spot, mining provides a nice change from drygulching, hostile Indians, runaway stage coaches, stampedes and Mickey Finns at the local dance hall. No good guy worth his high heel boots has lived until he's fought it out underground with the bad guy.

Some features of mining in the horse opera bear close scrutiny. First—take a look at the lighting. No matter how far from the portal (there are *no* shafts in western pictures except those on arrows) the boys wander in cat-and-mousing around, it never gets too dark to see. (Naturally no one carries a candle to light up the target.) In fact, we suspect that many an ambitious young cameraman has inched his way up the professional ladder with exciting shots of shadows of stalking, gunslingers cast in an unlit mine.

Another feature that intrigues us in Western movies is the fact that in most mines more seems to go in than comes out. Stolen mail sacks, herds of cattle, smuggled Chinamen and an occasional rancher's daughter all go into the mine. Nine times out of ten there isn't even a waste pile to show that *anything* ever came out of the mine.

In those rare instances when the mine does produce something its pretty sure to be gold although modern Westerns show a definite trend toward uranium. Gold in these mines generally occurs as bricks. At least we must assume this since no one has ever seen a mill or a furnace anywhere on the premises. Occasionally, in a fit of realism, a long tom is placed outside the portal by the prop man.

It may come as a blow to our friends who manufacture mining machines, but they just aren't used in Hollywood mining. Picks and shovels, yes. Drifters and compressors, no. Not a solitary piece of drill steel has been noted; not even hand steel. However, they can rest easy in Wilmington because there is always plenty of high explosive around, generally in kegs, suitable for rolling down hills onto hostile people. In fact the kegs of powder, if used for mining at all, are piled carefully in front of the face. More often they are carefully piled in front of the hero. Just as the fuse burns to within a centimeter or two of the stacked powder, the hero's horse comes in and stamps it out or mistaking it for a stray piece of hay, eats it, to the disappointment of many of us misanthropes. (If we are not mistaken, one cowboy hero named his horse Deus ex Machina and trained him especially for situations like that described.)

Now that the cinemagnates, as it is written in the original Timespeak, know how weak their mining Westerns are, they may be glad to know that a qualified technical advisor is available at a modest (Hollywood standards) fee. Please write care of *E&MJ*.

(This is Part II of a searching monograph, "Mining is Just the Rubbish on the Avenue of Mass Communication." Search last month's issue for Part I.)

The "New Books" section from *The Technician*, a bimonthly publication of the students of Newark College of Engineering.

ADVERTISING AND MARKETING: How to Throw Harry and Bert Parties. The Complete Collection of Harry and Bert Commercials, Harry and Bert Go to the Rockies, Harry and Bert Bird Calls, The Return of Harry and Bert, The Sons of Harry and Bert, and Harry and Bert Meet the Wolf Man.

LAW: An Intimate Analysis of the Mann Act, Ambulance Chasing Made Fun, Analyzing Your Parakeet, I Was a Ping-Pong Player for the F. B. I., and How the Endocrate Polypastics.

ART: Neo-Impressionistic Post-Victorian Semi-Scrott Vase Inscriptions, How to Write on Walls With Chalk, Red and Its Uses, Blue and Its Uses, Green and Its Uses, Mauve and It's Useless.

MODERN SHOPS provide space for washing, inspection and checking of equipment, and efficient machine shop operation.

GREASING follows every third shift, as does check of oil level in engines, filters, converters. Chart sets methods.

How To Improve Truck Maintenance

THREE IDEAS on truck maintenance have proved profitable for operators of a number of copper pits in Arizona: (1) maintenance is necessary for efficient production and not just a necessary evil; (2) equipment deserves the care that any craftsman gives to his tools; (3) close cooperation with the manufacturer can improve performance.

E&MJ has just completed a survey of a number of copper pits in Arizona which use truck haulage. Daily production of ore and waste material ranged from 24,000 tons at one of the smaller operations to more than 49,000 tons at the largest. Size of truck fleets, including standby equipment, varied from 11 to 27 trucks, and capacities from 22 to 50 tons.

In many instances the vehicles are tailored to the operation, a result of close cooperation between operator and manufacturer. Incorporated in design are torque converters, special transmission and brake assemblies, hydro retarders, etc., and the single or twin diesel engines providing motive power have been equipped with turboblowers and oil retarders to increase engine output and reduce downtime for repair and maintenance.

Haulage distances range from 1200 ft to a maximum of 4 miles in one instance (paved road), with adverse road grades seldom exceeding 6%.

All programs include in their framework a definite schedule of operations, assignment of these operations as a responsibility and supervision to see that these responsibilities are carried out.

Management is laying particular stress on engaging and training supervisory personnel for the different phases of truck maintenance work, including tire specialists. The maintenance superintendent, usually the master mechanic, is given plenty of authority. Simple card index systems covering engines, converters, transmissions, tires, and others and daily reports from truck operators remind him and supervisors under him of

HAULAGE TRUCK PREVENTIVE MAINTENANCE BOARD

Truck No.	Eng. Hours Total	Eng. Hours Since Overhaul	Brakes			Remarks	Date		Hour		Done			
			Date	Hr	Size		500	1000	1500	2000	3000	4000	5000	6000
1●														
2●														
3●														
4●														
5●														

COLORED WASHERS, hanging alongside truck numbers, tell the crews when each truck needs care. Green washer indicates machine in good order, yellow signifies that the truck is due for checkup within 50 hr, red washer means it's past due.

General Lubrication Chart of Off-Road Trucks

Unit or Part	Product	Ambient Temp. Above 32 deg F	Ambient Temp. Above 10 deg F
Crankcase			
Gasoline engines	Heavy-duty motor oil	SAE-30	SAE-10
Diesel engines	Heavy-duty motor oil	SAE-30	SAE-10
Distributor rotor shaft			
Oil	Heavy-duty motor oil	SAE-20	SAE-20
Grease	Multi-purpose grease		
Ignition distributor, generator, starter magneto	Heavy-duty motor oil	SAE-20	SAE-20
Engine fan hub (if lubricated)			
Oil	Heavy-duty motor oil		
Grease	Multi-purpose grease (or chassis lubricant)	SAE-20	SAE-20
Engine water pump (if lubricated)			
Plain bearings	Multi-purpose grease (or water pump lubricant)		
Ball bearings	Multi-purpose grease (or chassis lubricant)		
Air filter	Regular-type motor oil (or oil used in crankcase)	SAE-20	SAE-20
Hydraulic system	Heavy-duty motor oil (or manufacturer's recommendation)	SAE-20	SAE-10
Transmissions, differentials, hypoids, final drives, gear boxes	Multi-purpose gear lubricant	SAE-140	SAE-90
Universal joints			
Oil	Multi-purpose gear lubricant	SAE-140	SAE-90
Grease	Multi-purpose grease (or chassis lubricant)		
Steering gear			
Oil	Multi-purpose gear lubricant	SAE-140	SA-90
Grease	Multi-purpose grease (or chassis lubricant)		
Wheel bearings	Muti-purpose grease (or sodium soap-type wheel bearing grease No. 2)		
General chassis bearings			
Pressure fittings	Multi-purpose grease (or chassis lubricant)		
Grease cups	Multi-purpose grease (or sodium soap-type chassis lubricant)		
Clutch release and pilot bearings			
Oil	Heavy-duty motor oil	SAE-20	SAE-20
Grease			
Silent chain drives		Chain oils	
Slow speed	Engine oil (or oil used in crankcase)	Medium	Medium
High speed	Turbine type oil	Light medium	Light medium

HUMAN ERROR is avoided by confining responsibility of fleet lubrication to one department. Check list offers final guide for the shop and field greasemonkeys.

service check periods due on units, repair work to be carried out in the shop and by mobile units in the pit, provide a check on spare parts in stock, and afford opportunities to develop new methods and remove hindrance to scheduling. In many instances final control check is made by automatic punch-card equipment (I. B.M.). The preventive maintenance board shown on p. 75 installed in the superintendent's office has proved a very satisfactory check unit. A series of green, yellow, and red washers is used in conjunction with it. These are placed on small hooks available beside each truck number indicated on the left hand side of the board. The green washers indicate that the truck is in good working order, the yellow that the truck is due for the 500-hr inspection in 50 hr, and the red that the truck is due for inspection, or past due.

Another maintenance policy that pays good dividends at properties where adequate repair facilities are available is fast replacing of complete assemblies such as engines, converters, and transmissions. As soon as one of these units begin to show sign of trouble, it is removed intact, sent to the respective shop department for rebuilding or overhaul, and a new one installed in a few hours, preventing trouble from spreading to other parts.

Repair Shop Is Near Pit

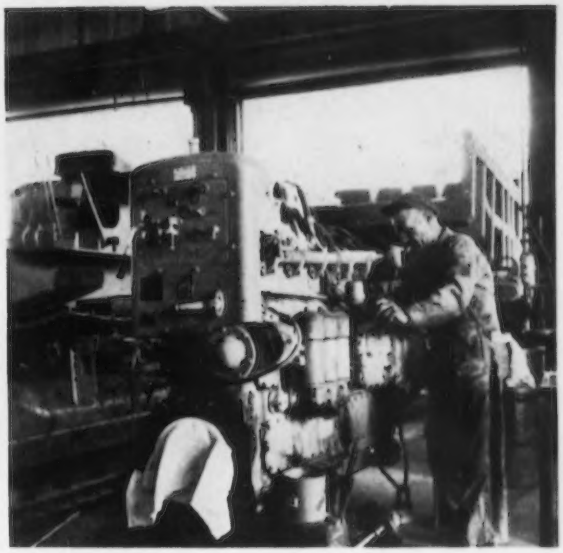
To carry out repairs and routine maintenance work, the companies maintain well equipped shops near the pit. Buildings housing the general shop, lubrication equipment, washing equipment, engine test stand, tire shop, paint shop, and welding shop are of steel construction, with roof and walls covered with corrugated iron sheets. The general repair shop contains modern metal working machines such as lathes, shapers, drill presses, milling machines, and others, and transfer and handling of heavy truck parts is facilitated by overhead and auxiliary cranes. One of the most versatile tools used on the truck inspection floor is the portable welder, electric and acetylene.

All machine work and unit rebuilding is carried out on day shift. General maintenance is done on both day and afternoon shifts. Field repairmen operate on all three shifts. The service trucks used are equipped with two-way short wave radio so that the repairmen can be contacted without delay at any time. Before each haulage truck is brought to the shops for servicing, it is thoroughly washed in a separate area. This permits more thorough inspection of truck parts and assemblies. It also speeds removal of defective parts and in general, reduces repair down time.

Servicing on Schedule

Truck service and general maintenance operations practiced at the different properties visited follow a more or less established standard. Each truck is brought to the shops for greasing, washing, and inspection of the chassis, springs, etc. after 3 or 3½ shifts of operation. At 500 hr the truck is given a thorough inspection

GENERAL RECONDITIONING of a Cummins NRTO diesel engine at one of the properties also involves grinding valves.



OVERHAUL WORK starts on a dismounted diesel in one of the general maintenance and repair shops, following 5,000 hr.

COMPLETE INSPECTION of two GMC diesels at an Arizona pit include check of ignition, carburetors, oil filters, etc.

THE WHEELS bear the freight . . . so particular attention must be paid to flanges on newly mounted tires, bolts and hubs.

and tuning. Work done during this period is indicated in a general way in the maintenance schedule shown. Engine oil and filters are changed after 150 hr service. Wheel and spindle inspection and packing of front wheels take place every 1500 hr. Engines on an average are overhauled after 5,000 hr running time, in most cases at the shop and in others, when major repairs are required, at the manufacturer's nearest branch factory. Converters and transmissions are reconditioned at from 8500 to 12,000 hr. Brakes require relining at from 2500 to 3,000 hr, and brake drums are reconditioned at from 5,000 to 10,000 hr. On new trucks the oil filters serving converters and transmissions are changed every 500 hr, and the oil at 1000 hr.

Turboblowers Up Output

Save for one property, where altitude and the small amount of adverse grades offer no apparent advantages, turboblowers installed on the truck diesel engines in most instances have given satisfactory service. Maintenance problems such as bearing wear, etc. are gradually being overcome. Service engineers of the manufacturers cooperate fully with the mine operator. Use of turboblowers has materially increased engine horsepower output with consequent higher mph truck speed and decrease in the operating cycle time. Fuel consumption is not appreciably affected. At one property installation of turboblowers has increased mph speed from 6 to 8, reduced cycle time from 20 to 14.1 min, or 24.5%, and brought about an average increase in fuel consumption of only 1½ gallons per hour.

Turboblowers now in operation on

Mechanic's Work Sheet

PREVENTIVE MAINTENANCE SCHEDULE

ENGINE — R L

Fuel System
- Back flush injectors ☐☐
- Adjust valves & injectors (engine hot) ☐☐
- Recalibrate fuel pumps ☐☐
- Tighten all connections ☐☐

Lube System
- Tighten pan bolts ☐☐
- Check and tighten all hose connections ☐☐
- Check filters for leaks ☐☐
- Check dipstick & filter cap (replace if worn) ☐☐
- Record oil pressure (engine warm) ☐☐
  - Idling ☐☐
  - 2100 ☐☐
- Record stall speed ☐☐

Cooling System
- Check & replace all worn hose ☐☐
- Tighten connections ☐☐
- Check water pump & fan belts ☐☐

Intake System
- Tighten all connections ☐☐
- Check air filter connections ☐☐
- Hoses & clamps ☐☐
- Check all hoses & tubes for holes ☐☐
- Check gaskets & manifold mounting bolts ☐☐
- Use squirt can to check all joints & clamps ☐☐

Electrical System
- Check wiring ☐☐
- Check generator & starter ☐☐
- Blow out dirt from generator & starter ☐☐
- Check operation of all lights ☐☐
- Set headlights ☐☐

Exhaust System
- Check all gaskets & mounting bolts ☐☐
- Check for broken manifold sections ☐☐
- Check turbocharger mounting ☐☐

CHASSIS

Front Axle
- Check spring piles for alignment & broken leaves ☐☐
- Check radius rods ☐☐
- Check toe in ☐☐
- Check king pin & bushing wear ☐☐
- Check spindle to axel ☐☐
- Clearance ☐☐

Rear Axle
- Check spring bolts for tightness ☐☐
- Check spring wedges ☐☐
- Inspect torque rods ☐☐
- Check cross shaft for looseness ☐☐

Drive Lines
- Check all "U" joints for looseness ☐☐
- Check & tighten flanges ☐☐
- Tighten differential pinion nut ☐☐

Cab
- Check all glass ☐☐
- Check door latches ☐☐
- Check operation of all gages & instruments ☐☐
- Tighten mounting bolts ☐☐

Dump Box
- Repair all loose liner plates ☐☐
- Repair breaks in substructure ☐☐

Converter-Transmission
- Check hoses & connections for leaks ☐☐
- Remove & clean lube oil manifold ☐☐
- Tighten transmission mounting bolts ☐☐

Hoist System
- Check scopes for leaks ☐☐
- Check & tighten all lines ☐☐
- Check pumps for leaks ☐☐
- Check adjustment of linkage ☐☐

Brake System
- Check all boosters ☐☐
- Check all slack adjusters ☐☐
- Check all air lines for leaks & wear ☐☐
- Check operation of treadle valve ☐☐
- Check operation of brakes ☐☐
- Record maximum air pressure ☐☐

Steering System
- Tighten steering column mounting bolts ☐☐
- Inspect & tighten ball studs, anchor studs, idler arm ☐☐
- Check tie rod ends for wear ☐☐
- Inspect booster pump & lines for leaks ☐☐
- Adjust Pitman arm stops ☐☐
- Check operation ☐☐

Frame
- Check and repair all cracks ☐☐

OTHER WORK

REMARKS

SYSTEMATIZED work sheet is another part of careful maintenance. Following the philosophy that pit equipment must be handled as a craftsman treats his tools, pit operators have gained major savings in man-hours, capital costs and downtime.

TUBE DAMAGE can be avoided before it gets started with careful buffing of the rubber boot inside the truck tire casing.

HYDRAULIC PRESS aids rapid removal of worn tire from wheel flange. Operators agree on benefits of tire recapping.

an average are removed for adjustment and overhaul at from 1000 to 1200 hr.

Tire repair shops at most properties are under the jurisdiction of a supervisor or foreman. In addition to his general inspection work, he keeps card records on each tire in operation, including wheel position and truck. He keeps a check on tire stock, inspects worn tires for recapping possibilities, observes driving habits of operators, and sees to it that recommended tire pressures are maintained at all times, and light repairs such as placing simple boots and mounting and demounting of tires are properly done.

For instance, the little extra time spent during a tire change to remove all water and dirt—and get casings, tubes, and flaps properly installed—pays handsome dividends. Management has found that employment of a supervisor, and systematic tire care reduce equipment downtime and lengthen truck life.

Presses in Shops

Many truck repair shops are equipped with special presses to facilitate quick removal of the larger size tires from wheel flanges. No recapping or placing of tire sections is done at the shop. Tire sizes used include 14x24, 16x25, 18x24, 18x25, 18x 33, and 29.5x29. Deep groove tires and tubeless tires are being tested at many properties and results obtained so far have been good. The deep groove unit offers 50% more tread at a price only 15% higher than that of a standard tire.

Does Recapping Pay?

The majority of supervisors and pit superintendents interviewed answered this question in the affirmative. Average cost of recapping a tire and the average life of a recapped tire respectively are about 40 percent and 70 percent of that of a new tire. To obtain an efficient recapping job it is imperative that the tire carcass sent to the factory at Globe, Phoenix, or Tucson is sound. As a consequence, the supervisor sees to it that tires are removed from the truck before tread wear has reached the danger point. Collected tire carcasses are carefully inspected by him and a representative of the recapping plant prior to shipment. The following tire performance figures, both new and recapped, obtained at three of the largest pit operations may be of interest.

At company A, the 39 tires of the 16x25 type junked during the first quarter of 1957 average 14,667 miles (or at 7.5 mph speed factor, about 1,968 hr). Average cost per mile, 3.95c.

Company B for 36 tires of the 16x 25 type reports an average of 19,656 miles (about 2,457 hr at speed factor of 8 mph). Of these 24 were recapped, giving an average of 10,112 miles (1,264 hr) extra service, and a total average per carcass of 26,399 miles (3,299 hr). The figure for the 105 tires of the 14x24 type is 14,160 miles (1,770 hr). The 62 tires recapped from this lot gave an additional average of 9,120 miles (1,140 hr), making a total of 19,548 miles (2,443 hr) for each carcass.

Company C figures for 215 capped tires of the 16x25 type are 11,480 miles (1,435 hr at 8 mph speed factor) before recapping, 8,423 miles (1,054 hr) after recapping, or a total of 19,912 miles (2,489 hr). For 46 capped tires of the 18x33 type, the average mileage per tire obtained before recapping was 15,831 miles (1,795 hr) and 10,704 miles (1,338 hr) after recapping, making a total of 26,535 miles (3,097 hr) per carcass. A number of these tires were recapped a second time giving another 7,168 miles (896 hr) of service, or a total of 33,703 miles (3,993 hr).

Supervised Lubrication

To provide adequate and efficient lubrication service, the companies maintain independent buildings housing the pneumatically operated greasing equipment, oil filtering installations, and others. Mobile units are available for servicing equipment away from the shops and in the pit. This department, too, is headed by a supervisor or foreman. It has been found that by having one lubrication man with know-how handle everything, issuance of handguns to truck operators is completely eliminated. The job will be done, regardless where the equipment is working, with every part of the truck and auxiliaries getting the service required. The supervisor also knows exactly what type of oil and grease to use. These are given in the general lubrication chart shown. He and his helpers periodically attend lubrication meetings arranged by the superintendent of maintenance and attended at times by oil company field engineers.

New Free State Project Installs Modern Shaft-Sinking Equipment

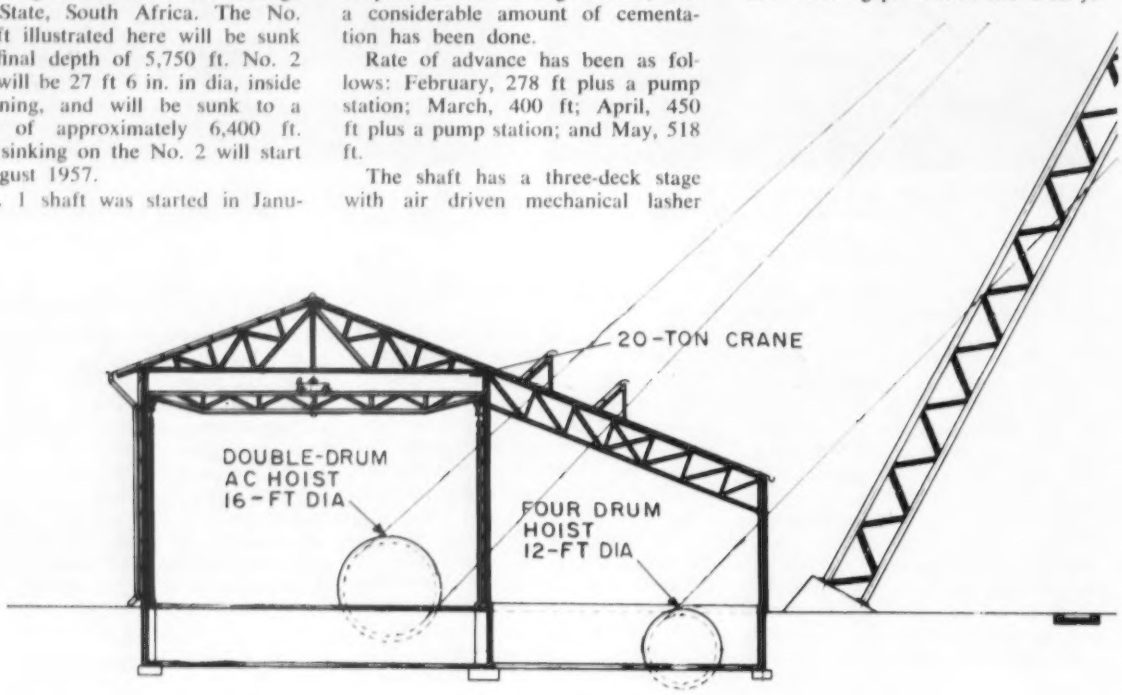
FREE STATE SAAIPLAAS GOLD MINING CO., LTD. is using the surface plant and shaft sinking equipment shown in this article to put down two 24-ft dia concrete-lined shafts at its property adjacent to the Harmony and Virginia gold mines of the Orange Free State, South Africa. The No. 1 shaft illustrated here will be sunk to a final depth of 5,750 ft. No. 2 shaft will be 27 ft 6 in. in dia, inside the lining, and will be sunk to a depth of approximately 6,400 ft. Shaft sinking on the No. 2 will start in August 1957.

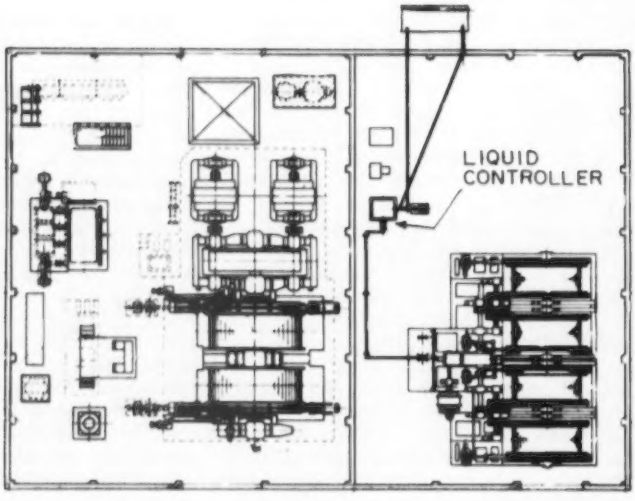
No. 1 shaft was started in January 1957, and during that month was advanced 684 ft through the Karro shales. After the shaft entered the Ventersdorp upper lavas and sediments, pilot-hole drilling for cementation has been carried out as part of the sinking routine, and a considerable amount of cementation has been done.

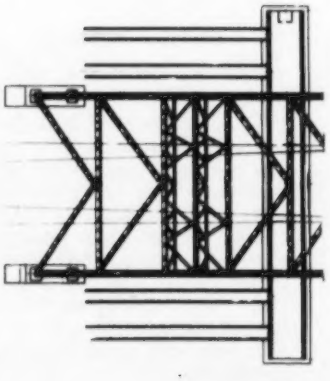
Rate of advance has been as follows: February, 278 ft plus a pump station; March, 400 ft; April, 450 ft plus a pump station; and May, 518 ft.

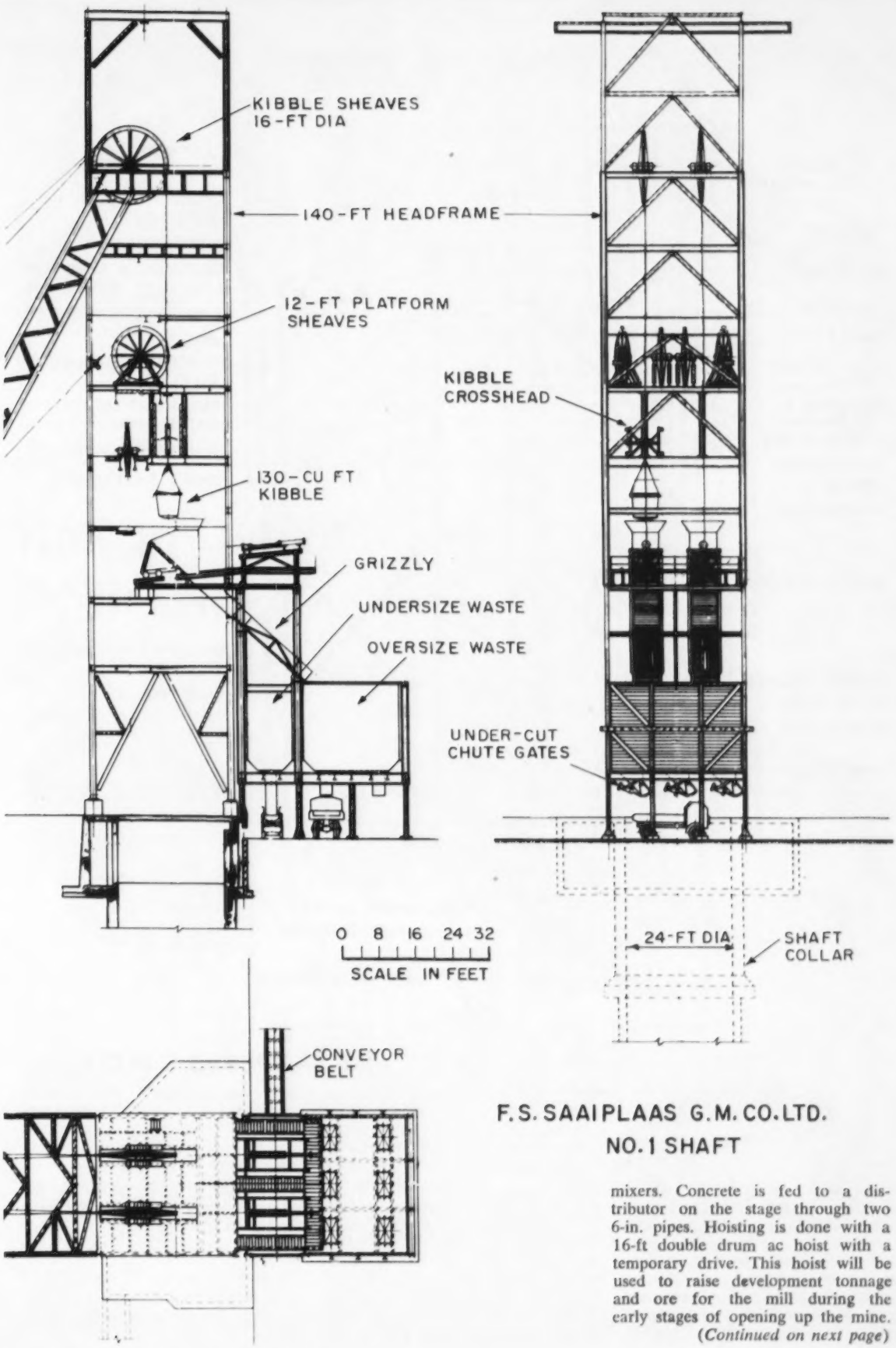
The shaft has a three-deck stage with air driven mechanical lasher operating a 20-cu ft cactus grab, loading into 7½-ton kibbles (130-cu ft). Lashing rate with this equipment is approximately 150 to 180 tph, and tons per foot advanced is 50.

Concrete is mixed on the surface in a batching plant with two 1-cu yd





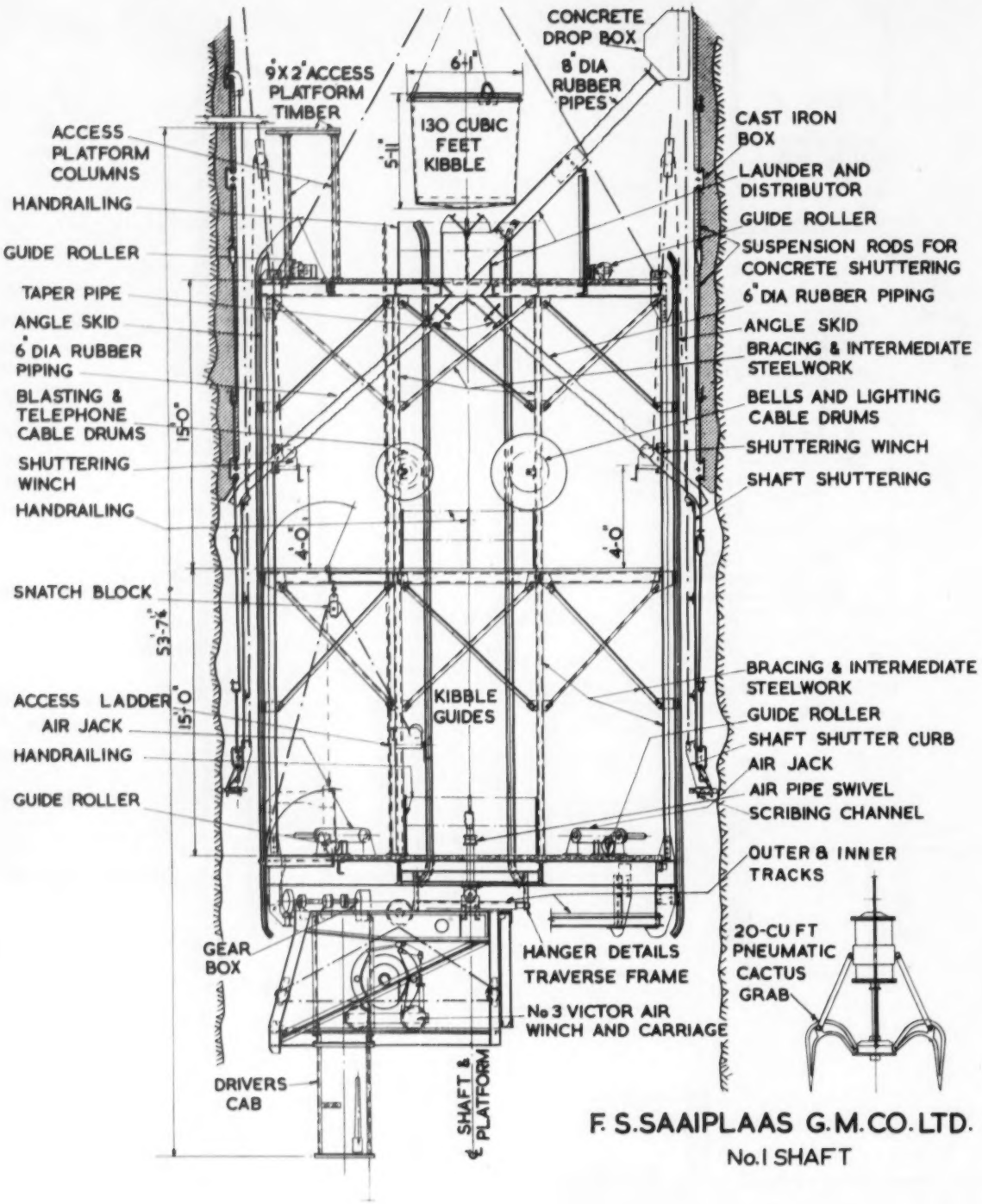




F.S. SAAIPLAAS G.M. CO. LTD.
NO. 1 SHAFT

mixers. Concrete is fed to a distributor on the stage through two 6-in. pipes. Hoisting is done with a 16-ft double drum ac hoist with a temporary drive. This hoist will be used to raise development tonnage and ore for the mill during the early stages of opening up the mine.

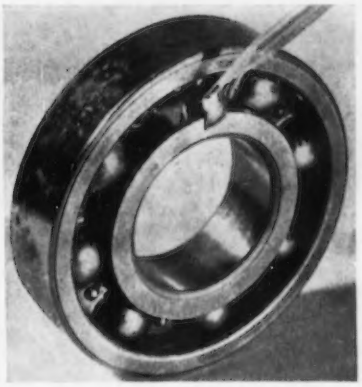
(Continued on next page)

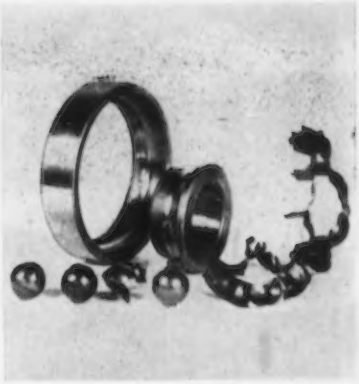


A 250-hp single-drum hoist is provided for installation and maintenance of service piping and general use.

Under normal conditions, through the shales on a four-shift basis, a daily advance of 30 ft sunk and lined can be obtained. On a three-shift basis, sinking through lavas, the usual footage advanced is 20 to 24 per day. For cementation drilling, an experimental rig has been introduced which shows considerable promise. Cementation cover drilling is done regularly. The round varies to suit conditions—some rounds consisting of 16 holes to 180 ft. Full cementation through pilot holes will be carried out for all shaft sinking and for all subsequent development. With the use of the rig, improvement in direction control and drilling time has been indicated.

E&MJ is indebted to the management of New Consolidated Gold Fields Ltd. for this useful operating information.





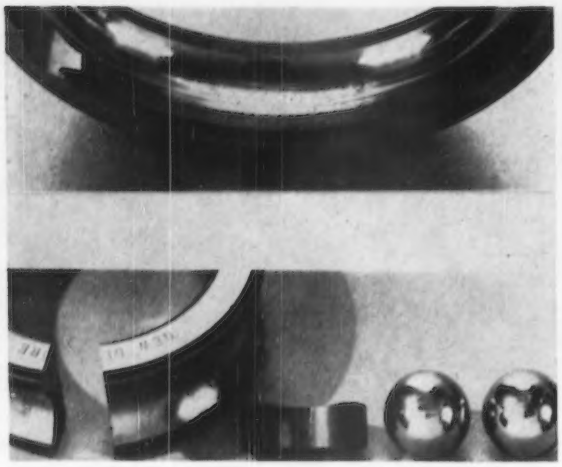
FAULTY LUBRICATION. Lubricants diminish friction between balls and separators; remove heat from high-stress areas; prevent rust and corrosion; and protect bearings against dirt, water and corrosive fumes. Note how the ball separator (left) became discolored due to heat caused by lubrication failure between balls and separator. Continued lack of lubricant will cause the separator to crack and break (center), or to fail completely as shown at right where the separator broke at one of the ball pockets. Complete failure of adjacent parts is imminent. To prevent these failures check both lubricant and method of application by maintenance crew.

How to Determine the Causes Of Bearing Failure in Your Plant

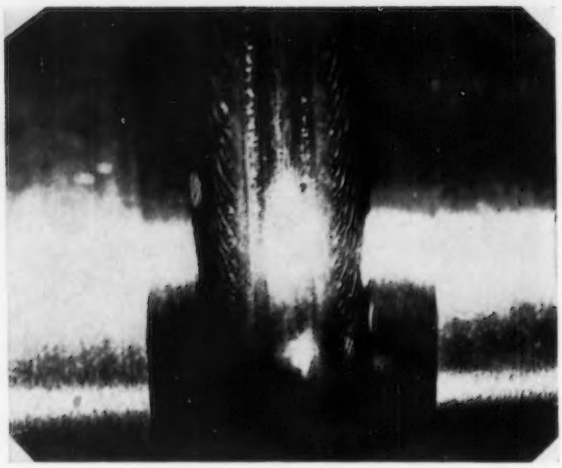
FAULTY LUBRICATION. Continued operation in presence of a poor lubricant can be as damaging as operation with scant lubrication. Resulting high temperatures during operation will cause discernable tempering and discoloration of the of the ball separators. In unit (top left) ball separators are broken, and races show evidence of tempering. Bearings with phenolic-base non-metallic ball separators are also susceptible to failure due to poor lubrication, even though the separators can absorb more lubricant than steel ones. Bearing (lower right) is one of this type on the verge of a breakdown.

Illustration (top right) shows what happens when a bearing with a non-metallic separator actually breaks down. Balls and inner rings became discolored. Nevertheless they were in good condition otherwise. This points up the ability of non-metallic type separators to continue to partially lubricate the bearing for a long time without failure even after the lubrication system has failed.

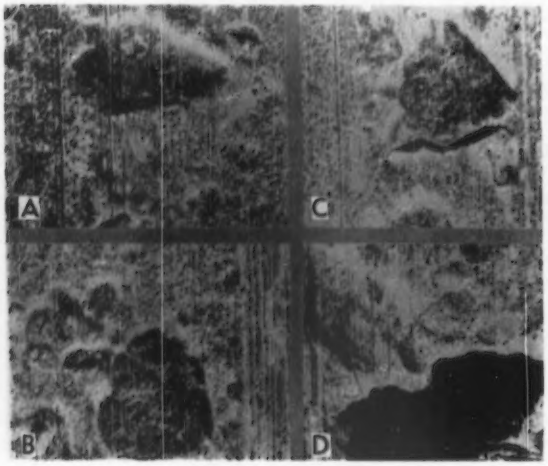
The best way to eliminate bearing failures of this type is to insure positive lubrication at all times. As an added precaution, train your maintenance men and mechanics to examine bearings carefully for the signs mentioned here that point to imminent failures.



TARDY LUBRICATION. In some machines which operate intermittently, flow of lubrication may not reach the bearing until some time after the machine has started. Damage of the type shown above may result. Rapid acceleration with no lubrication scores and galls the race. To prevent this type of damage, check your lubrication and be sure that it gets off to a fast start on those stop-and-start machines in your mine and metallurgical plant.



POOR GREASE. Bearing grease should have proper film strength to carry the load applied to contact surfaces between ball and raceways. Here, due to deformation, sliding motion occurs. An oil film reduces friction and helps dissipate heat. Failure of the oil film under high-load conditions causes bearing gall (shown above). When your mechanics detect this kind of failure, tell them to consult a grease-lubrication specialist.



JUST PLAIN DIRT. When dirt and grit get into a bearing, abrasion results. Most bearing failures are probably due to foreign materials in internal parts. These 100 magnification photos (at left) show in sequence what happens to a raceway when a dirt particle gets in. Damage was produced under controlled laboratory conditions. "A" shows depression caused by the ball's passing over a hard particle. "B" shows same depression after several hours of operation. "C" shows a crack which developed after 30 hours of operation. After another 30 hours of operation the condition shown in "D" resulted. The crack has widened and joined the spalled area caused by initial indentation.

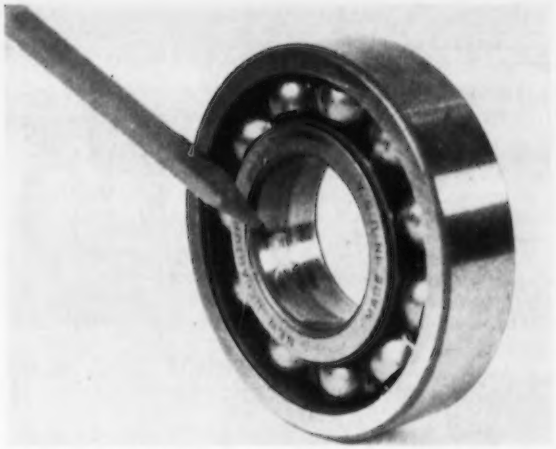
You do not need a 100-magnification photo to identify large-particle abrasion. Damage and depressions caused by large particles will be plain enough to be identified with the naked eye.

Inspection of the closures may reveal the source of entry of the dirt. If the problem is recurrent, a thorough review of bearing storage, handling and mounting procedures may be needed to track down the source.

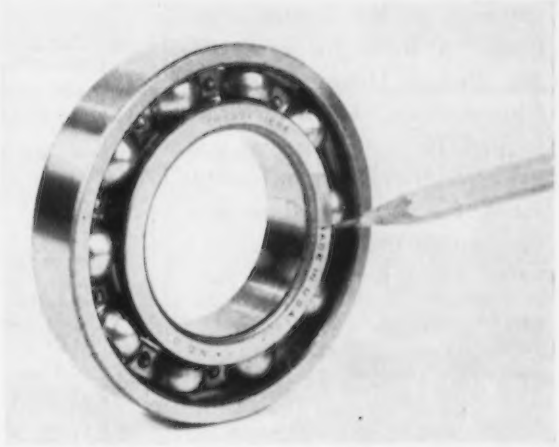
PHOTOMICROGRAPHS
of electrical damage areas

ELECTRICAL DAMAGE. If you've watched an electric arc-welding operation, you will have noted how the arc can cut, pit and fuse metal surfaces. This same damage can be imparted to bearing parts by static electricity from line shafting, stray currents or short circuits from electrical apparatus on the machine. Damage usually occurs at the contact between ball and raceway where fused spots resembling welds may appear. Actual tempering takes place under the race and a hardened area is created at the surface. Subsequently, the whole affected section separates from the raceway.

Photomicrographs (at left) show the type of damage done to bearing parts when stray currents start arcing from one surface to another. When this happens, the bearing usually becomes very noisy. If damage of this kind occurs, it's time to call in your plant electrician. He'll be able to trace the source of stray currents, and install the proper insulation and grounding devices to keep stray currents out of the hearing areas.

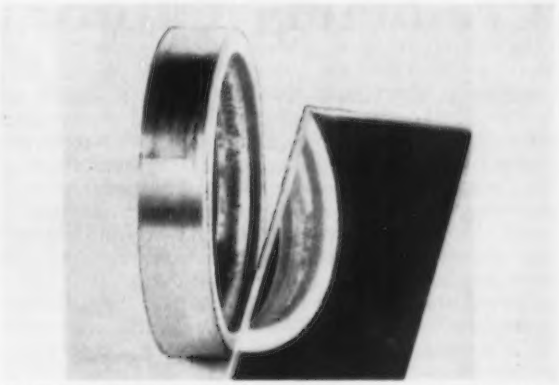


LOOSE FITS. Bearings should be mounted with a press fit on the rotating ring. Generally the shaft rotates and the inner ring is mounted with a firm press or interference fit. If this fit is loose, rotation of the shaft within the ring may produce loose particles of metal. These will cause wear on balls and races. To detect this condition, listen for noisy operation, and watch for scoring of inner ring and shaft seat (above).



TIGHT FITS. Cracks (shown above) will result if the fit on the inner ring is too tight. A tight fit on the outer ring causes it to crack also. If rings do not fail immediately, tight fits may cause high internal preloads. This results in high operating temperatures and production of iron oxide from pressures on inner raceways. To detect this condition, keep alert for high temperatures and high-pitched bearing sounds.

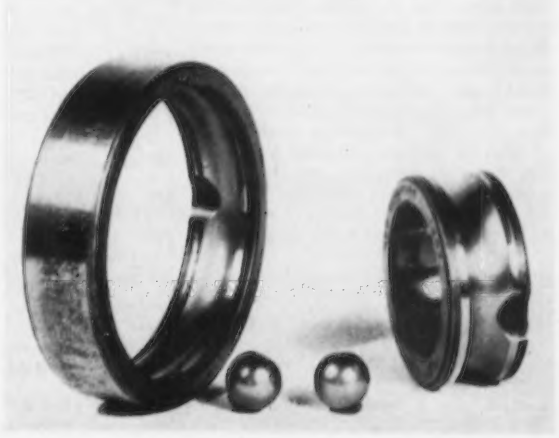
LOOSE HOUSING FIT. If the housing is the rotating part, a tight fit between outer ring and housing is necessary. If the fit loosens, scoring and abrasion will damage the ring as shown above. Sometimes "cold working" of the outer ring in its seat results in a cracked outer ring. Signs pointing to this condition are: too easy removal of the bearing from its housing, and scoring of the outer ring.



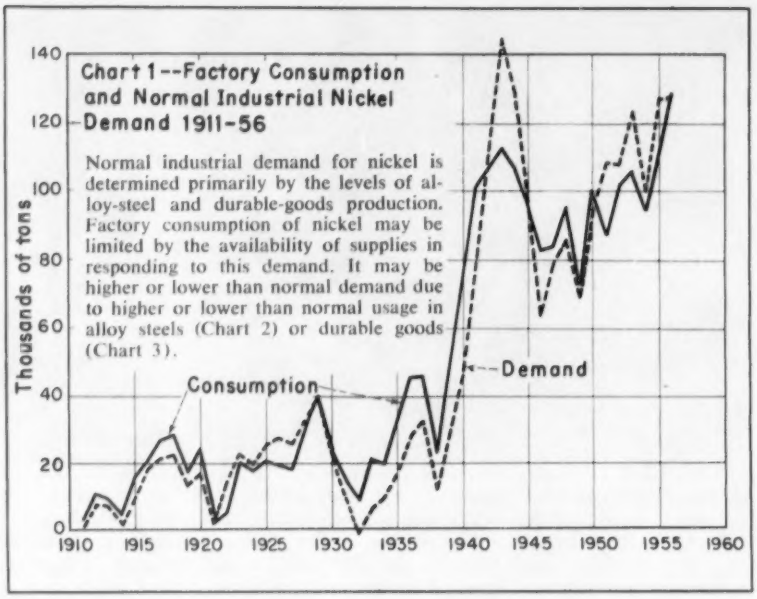
OUT-OF-ROUND HOUSING. This condition is often found in split housings where very careful machining is necessary to obtain a truly round housing. It results in localized overloading of the bearing, and fretting of the outside diameter near areas of too tight fit. The raceway becomes fatigued under overstressed area. This condition also causes abnormal wear on separator ball pockets.

VIBRATION BRINELL. A peculiar type of damage occurs as a result of vibration from outside the machine in which a bearing is mounted. This is called "vibration Brinell." Vibration causes rapid, imperceptible movements of the balls, either while in a static position of non-use, or while the machine is operating. The condition is identified by slight Brinell marks giving a washboard effect in the ball raceway. In operation this condition is revealed by excessively noisy operation on a low note.

ACKNOWLEDGMENTS. The foregoing practical information which will help your mechanical staff detect causes of bearing damage and prevent such damage is excerpted from a series of four booklets on bearings which may be obtained from New Departure Division, General Motors Corp. Bristol, Conn. *E&MJ* acknowledges with thanks permission to use this information and the special photos presented in this article.



Interest in Mr. Lytton's report, "A Basis for Forecasting Nickel Demand in the United States" has been widespread in both mining and manufacturing companies. Here, for the first time, is a closeup of the method.



BOTH DEMAND AND CONSUMPTION have reached peak levels six times since 1911. Consumption surpassed demand in 1911-21, 1929-41, and 1946-50; while demand exceeded consumption 1922-28, 1942-45, and 1951-55. World War I over-consumption and subsequent under-consumption reflected mainly conditions in alloy steels (Chart 2). Underconsumption in the latter two wars was due to increased potential demand, accompanied by severe restrictions on consumption in less essential end uses.

Predicting Future Nickel Consumption

HENRY D. LYTTON

DEMAND FOR NICKEL could reach 241,000 tons by 1965 if we assume that there will be neither war nor violent depression. This figure is not plucked out of a hat. It is based on the high correlation between industrial demand for new nickel in the U.S. and the demand for alloy steel and durable goods, as reflected in their respective production measures on a physical-quantity basis, in normal peacetime years.

This conclusion is based on several months' statistical research and analysis of the consumption-by-use pattern of nickel and of corresponding demand indicators for the full 45 years, 1911 to 1955, and the first quarter of 1956.

The basic research was conducted in October-November 1953, preparatory to writing two privately reproduced study reports, completed in the late summer of 1956. Additional research in June-July 1956 extended the data through the first quarter of 1956 for the 1956 forecast and enabled the author to make necessary recalculation of reliability measures. Finally, data have been added for the year 1956 as a whole, in order to provide comparisons with forecasts made halfway through the year—when only first quarter data were

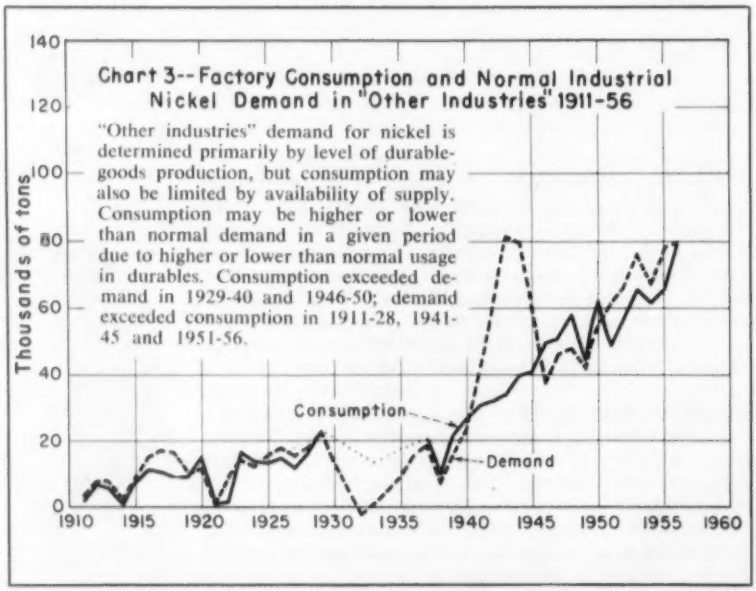
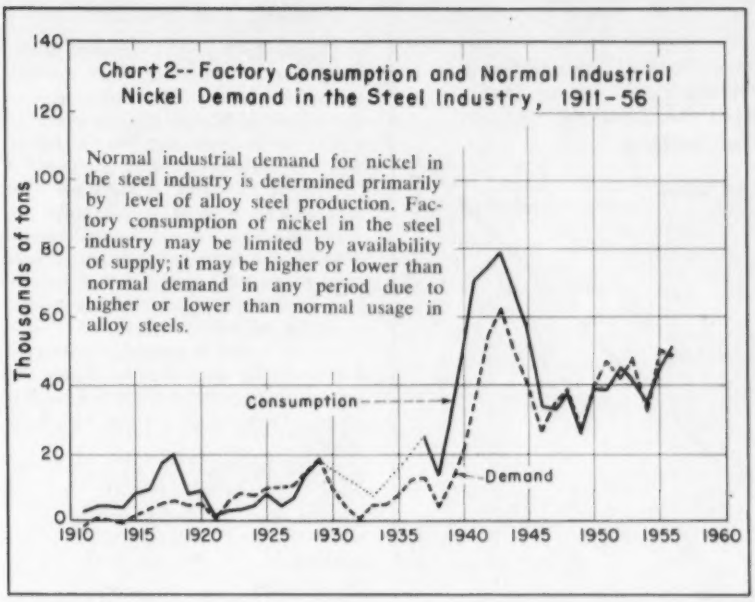


Chart 3--Factory Consumption and Normal Industrial Nickel Demand in "Other Industries" 1911-56
"Other industries" demand for nickel is determined primarily by level of durable-goods production, but consumption may also be limited by availability of supply. Consumption may be higher or lower than normal demand in a given period due to higher or lower than normal usage in durables. Consumption exceeded demand in 1929-40 and 1946-50; demand exceeded consumption in 1911-28, 1941-45 and 1951-56.
Thousands of tons
Consumption
Demand
0
20
40
60
80
100
120
140
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960

MARKET DEVELOPMENT activities permitted sharp recovery of consumption after WW I. Underconsumption in all three major conflicts was due to lower than normal amounts of nickel being used per ton of durable goods because of elimination of decorative uses, restrictions on civilian durable-goods production and other restrictions (partly offset during the Korean hostilities by greater use of high-temperature alloys in jet aircraft). Consumption data not available for 1930-32, 1934, 1936; and are interpolated for 1940 and 1942.

Mr. Lytton, now management staff officer for the Veterans Administration, has made numerous commodity analyses for industrial firms, business research bureaus and management engineering firms.



PEAK LEVELS in demand and consumption were reached in 1911-21, 1929-46 and 1952 when consumption exceeded demand, and in 1922-28 and most of 1951-55, when demand led consumption. They ran approximately parallel in 1947-50.

Despite greater alloy steel output in the 1920's, less new nickel was consumed than during WW I because of wartime promotion of nickel for armaments and the postwar outflow of scrap nickel recovered from armaments. Overconsumption in and before the two world wars and during part of the Korean conflict was due to mobilization and warfare requiring higher than normal amounts. (Consumption data not available for 1930-32, 1934, 1936; and are interpolated for 1940 and 1942.)

available. Verbatim forecasts are presented at the end of this article, as written in mid-1956.

Method Used

The method of analysis and forecasting followed is a simple graphic correlation, using two component indicators, as opposed to the usual over-all indicators or independent variables. It was developed in view of the failure of logical over-all simple correlations, tried graphically, to yield a good fit.

For example, first total steel production and total durable-goods production were plotted against total nickel consumption, without much promise. Then alloy-steel production was plotted against total nickel consumption, with similar results. When, however, alloy-steel production was plotted against nickel consumption in the steel industry (which is 100% concentrated in alloy-steel production), considerable improvement was noted; and similar success attended the plotting of durable-goods production against nickel consumption in non-steel industries (which is 98% concentrated in durable-goods production).

Developing a method of analysis was complicated by another difficulty. Because of nickel's great strategic importance to the steel industry in wartime (which outbalances its lessened strategic importance to other industires at that time), and because of strategic stockpiling and the relative short-run and medium-run inflexibility of its supply, nickel consumption was generally believed to be subnormal with respect to its true demand throughout World War II and the Korean conflict, and even in 1955 and 1956. Thus many recent years could not be considered normal years for calculating normal demand.

A third problem arose from the unavailability of consumption-by-use data from 1933 to 1941, except for extimates obtainable by applying the International Nickel Co. sales-by-use percentage pattern to total U. S. consumption tonnages; the aforesaid pattern being a reflection of sales to Canada, the United Kingdom and the Continent, as well as to the U. S.—and hence reflective of more pre-World War II arming than warranted for the U. S.

A common solution to these problems resulted from placing major reliance and basing all estimating equations solely upon normal peacetime years in each of the two component correlation studies. Regression lines were fitted free-hand to such normal years in each scatter diagram. It was then found that deviations in war and pre-war periods, and in other abnormal times, progressively departed from and returned to the regression lines during the course of each such period. This finding not only supported the large-sample reliability measures based on the 23-year data not thereby eliminated (and adjusted for an infinite number of samples which might be drawn from the same universe), but also strengthened reliance thereon in the one case (fiduciary limits of the adjusted correlation coefficient) where a small-sample adjustment was liable to make any perceptible change.

Because the two component correlation studies appeared to offer no possibility of further improvement commensurate with the required additional effort, they were left as simple correlations. It might be noted, however, that nickel demand in each case was automatically associated with broad per capita economic cyclical, growth, seasonal, and residual factors—as well as with population—through its correlation with an apparent single consumption factor in each case.

As a final comment on methodology, whereas the approximate regression lines and corresponding least-squares solutions were determined separately for each component correlation, the reliability measures were determined on a composite or over-all basis.

Detailed Consumption Pattern

Not only is total nickel consumption a composite of steel and non-steel usage, but these components in turn are composites of further subdivisions of consumption-by-use, available for up to 19 of the 26 terminal years of the 45-year period, i.e., from 1930 to 1955, as follows:

Steel industry (data since 1944 only)

Engineering or low alloys—14 to 30% of total nickel

Stainless-steel alloys—17 to 27%

Other industries (estimated 100%-coverage basis)

Nonferrous alloys and castings—16 to 48% of total nickel

Electroplatings—1 to 21%

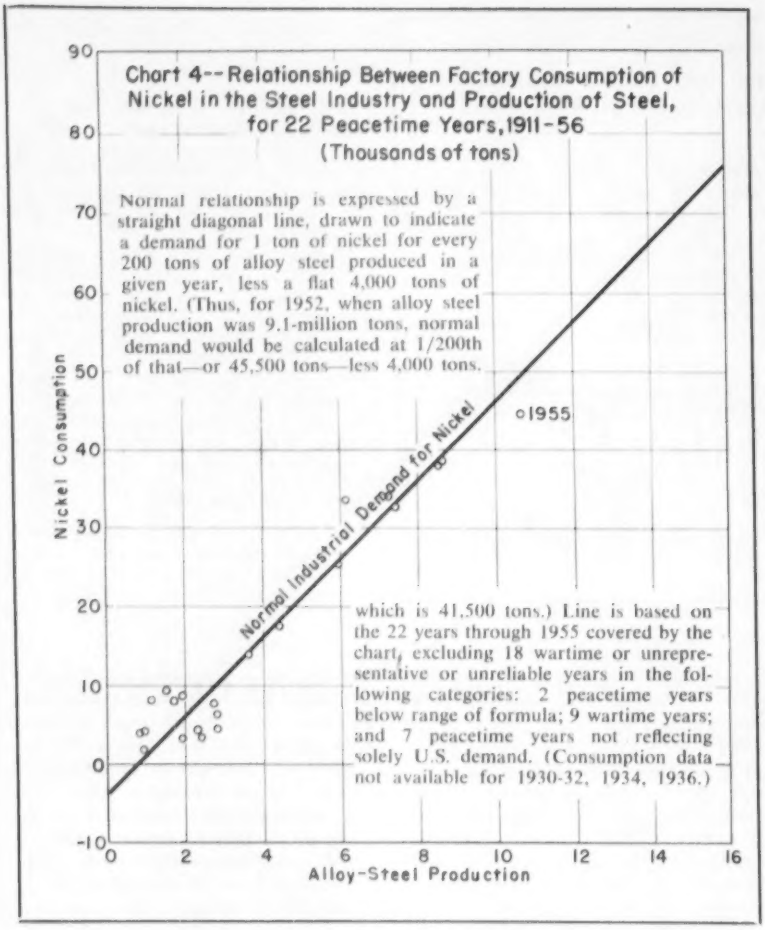


Chart 4--Relationship Between Factory Consumption of Nickel in the Steel Industry and Production of Steel, for 22 Peacetime Years, 1911-56
(Thousands of tons)
Normal relationship is expressed by a straight diagonal line, drawn to indicate a demand for 1 ton of nickel for every 200 tons of alloy steel produced in a given year, less a flat 4,000 tons of nickel. (Thus, for 1952, when alloy steel production was 9.1-million tons, normal demand would be calculated at 1/200th of that—or 45,500 tons—less 4,000 tons, which is 41,500 tons.) Line is based on the 22 years through 1955 covered by the chart, excluding 18 wartime or unrepresentative or unreliable years in the following categories: 2 peacetime years below range of formula; 9 wartime years; and 7 peacetime years not reflecting solely U.S. demand. (Consumption data not available for 1930-32, 1934, 1936.)
Normal Industrial Demand for Nickel
1955
Nickel Consumption
Alloy-Steel Production
90
80
70
60
50
40
30
20
10
0
-10
0
2
4
6
8
10
12
14
16

Nonferrous high temperature and electrical-resistance alloys—3 to 9%

Chemical (catalysts)—0.3 to 1.5%

Magnets—0.5 to 0.9% (data since 1950 only)

Ceramics—0.02 to 0.45% (data since 1945 only)

Other uses—1 to 6% (ex-magnets and ceramics)

How to Estimate Demand

The formulas used in estimating demand—and employed in all statistical calculations, tables and charts—were developed from consumption data extended during the latter stages of this study, and including published Bureau of Mines figures for 1946-55. These indicated the approximate percentages of consumption not canvassed in certain uses in those years.

As now calculated, the uncanvassed consumption in "other industries" averaged 1,560 tons, or about 3%, for the last six normal years on the non-steel scatter diagram (upper right-hand corner of Chart 5). However, although the finally corrected consumption data are used throughout, the regression lines, formulas, and calculated demand data remain based upon the original and uncorrected data and hence are subject to correction for a 3% error in later years in the non-steel component—and for an approximate 2% error in later years in the over-all formula. (Non-steel consumption of nickel has been approximately 60% of total nickel consumption in the recent period of "peacetime activity.")

The formulas, which were developed from the free-hand regression lines in Charts 4 and 5, embody slightly-rounded figures for ease in computation: (in tons)

I. Steel demand $= \frac{\text{Alloy-steel production}}{200} - 4{,}000$

II. Non-steel demand $= \left(\frac{7}{12}\text{ths of durable-goods production Index} \times 1{,}000\right) - 13{,}000$

III. Total demand $= \frac{\text{Alloy-steel Production}}{200} + \frac{7{,}000\ (\text{durable index})}{12} - 17{,}000$

Analysis and Interpretation

Charts 1, 2 and 3 present graphically for all available years the historical sequences of fluctuations in Actual or Indicated Consumption of nickel (with 1940 and 1942 components estimated by interpolation) and in Calculated Normal Demand for nickel. The general relationships involved and the supply-demand conditions ruling during the six major portions of the 45-year period are briefly described in the accompanying narrative material.

Charts 4 and 5 present for selected full years the data used to derive the regression lines (entitled "Normal Industrial Demand for Nickel") on each chart.

Exact relationships of nickel demand to causative factors, and the reasons for omitting observations available for certain years, are summarized in the accompanying narrative material.

Charts 4 and 5 indicate the general stability of the formulas during normal peacetime years. Charts 1, 2 and 3 indicate the only-slightly decreased applicability of the same formulas during wartime or other abnormal periods, and the complementary nature of the two major parts of the nickel market: what one market component foregoes the other is in a position normally to absorb—given the availability of supply, which in the case of this metal is almost entirely common to both.

How Formula Worked in 1956

* "In the first quarter of 1956, the output of stainless steel and the consumption of nickel in stainless steel reached new record-high levels; while the output of engineering-alloy steel reached a level second only to 1943—although the consumption of nickel in such steel showed no year-to-year increase and was only half that recorded in 1944 (the only war year of record).

"The greater nickel consumption by the stainless-steel industry, as compared with 1955 and 1944, was due partly to the general upward growth trend in that industry as a whole and partly to the rise of super-alloy (nickel-bearing) stainless-steel requirements for the expanded jet-engine and other new high-temperature uses. The relatively-static nickel consumption in the low-alloy industry was due to the growing replacement of short-supply nickel by chromium and molybdenum (and possibly by high-strength and silicon-sheet) grades of single-, double-

*This is a verbatim report of Mr. Lytton's prediction of nickel demand in 1956, made in July of that year.—Ed.

and triple-alloys; as well as to a reported designing-away (according to the BDSA Low-Alloy Industry Task Group) from nickel-bearing steels in favor of aluminum.

"Likewise in the first quarter of 1956, the output of durable goods reached levels substantially second only to 1943; while the consumption of nickel in non-steel industries reached levels far and away the highest on record. On a percentage basis, electroplating scored the largest increase (22%) over 1955 usage. This was in line with automobile output.

Second Largest

"The second largest percentage increase in the non-steel industries was made by nonferrous high-temperature (super) and electrical-resistance alloys —probably mainly super alloys for jet-engine uses, etc.; up about one-sixth from 1955 levels. Both this category and electroplating, as well as the five smallest non-steel uses of nickel, gave indications of new records for 1956 if the consumption of nickel continued unabated. On the other hand, nonferrous alloys (including nickel-copper and cupro-nickel, etc., for marine and other corrosion-resistance uses) although slightly ahead of 1955 rates, were still holding below the Korean conflict peak.

"In the second quarter of 1956, steel and durables output continued strong.

"The general business outlook for the second half of 1956 envisaged 'a slackening in the third quarter,' according to Secretary Weeks (*Washington Star*, May 20) to be 'followed by a resumption in growth,' with an expectation by his Business Advisory Council chairman of the fourth quarter regaining 'today's level in volume.'

"Machinery new orders, machine-tool shipments, and industrial-building contracts (*Business Week*, June 30)—and probably most producers'-goods indices—were stronger as of July 1, 1956 than 1955. However, automobile output and farm-implement production have sagged (*Washington Post*, May 25), as have housing-construction and the numbers of marginal producers in the home-appliance field (*Business Week*, May 19, June 2 and 23). A nationwide steel strike which began July 1, 1956 could lower all estimates if prolonged.

"Disregarding the effects of a long steel strike, the net impact of these factors might be about the same on the steel industry as on business activity generally; but somewhat less upon durable-goods production, due to the stronger producers'-goods and industrial- and highway-construction situations.

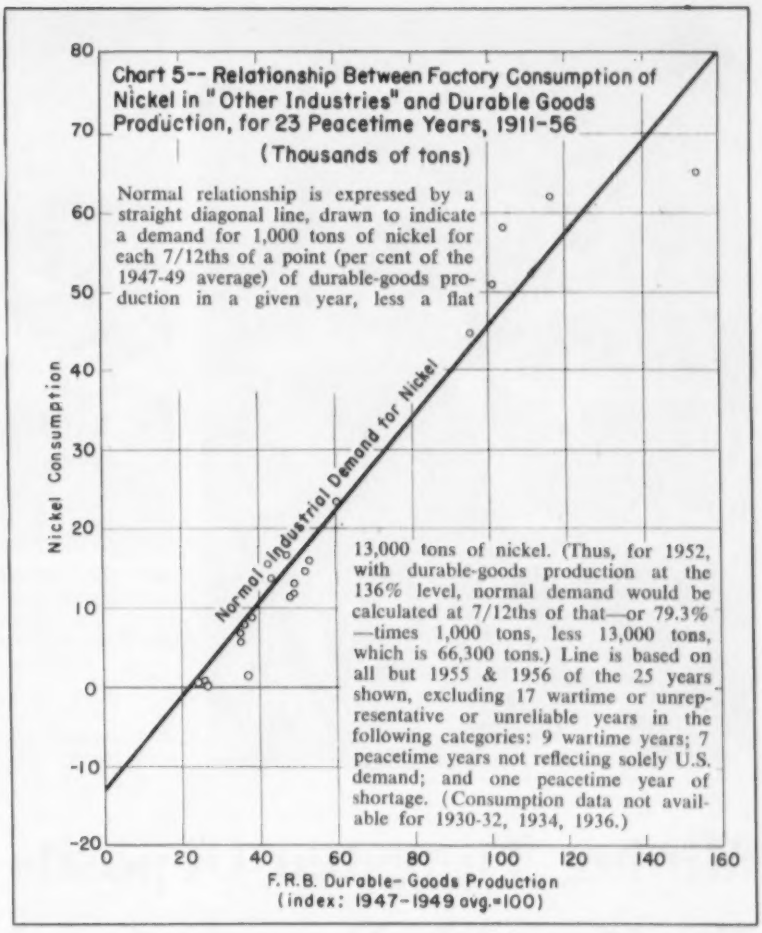


Chart 5-- Relationship Between Factory Consumption of Nickel in "Other Industries" and Durable Goods Production, for 23 Peacetime Years, 1911-56
(Thousands of tons)
Normal relationship is expressed by a straight diagonal line, drawn to indicate a demand for 1,000 tons of nickel for each 7/12ths of a point (per cent of the 1947-49 average) of durable-goods production in a given year, less a flat 13,000 tons of nickel. (Thus, for 1952, with durable-goods production at the 136% level, normal demand would be calculated at 7/12ths of that—or 79.3% —times 1,000 tons, less 13,000 tons, which is 66,300 tons.) Line is based on all but 1955 & 1956 of the 25 years shown, excluding 17 wartime or unrepresentative or unreliable years in the following categories: 9 wartime years; 7 peacetime years not reflecting solely U.S. demand; and one peacetime year of shortage. (Consumption data not available for 1930-32, 1934, 1936.)
Normal Industrial Demand for Nickel
Nickel Consumption
80
70
60
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
F.R.B. Durable-Goods Production
(index: 1947-1949 avg.=100)

Forecasts

"Steel production. May still total possibly about 115-million tons this year (1956), against 117-million tons in 1955 and a 127½-million-ton rate in the first quarter of 1956.

"Alloy-steel production. The alloy-to-steel ratio (which rose from the 5 to 7% pre-war range to stabilize in the 8 to 10% range in the last nine years) should at least average 9% this year, against 8.9% in 1955 and a 9.6% rate in the first quarter of 1956. This would mean an alloy-steel production of 10.4-million tons this year (1956), against 10.6-million tons in 1955 and a 12.2-million-ton rate in the first quarter of 1956.

"Durable-goods production. Could still average 155 index points for this year, or the same as in 1955, against 158 (seasonally-adjusted) for the first quarter of 1956.

"Nickel demand. Is accordingly forecast as follows, by substituting the above forecasts in the three formulae:

"In the steel industry—

$$\frac{10{,}400{,}000}{200} \text{ (or } 52{,}000), - 4{,}000 = 48{,}000 \text{ tons.}$$

In other industries—

$$\frac{7{,}000\ (155)}{12} \text{ (or } 90{,}400), - 13{,}000 = 77{,}400 \text{ tons.}$$

In all industries—

$$(52{,}900 + 90{,}400), - 17{,}000 = 125{,}400 \text{ tons."}$$

Accuracy Within 2½%

The over-all accuracy of the forecasts for 1956 was within 2½%. Forecast demand of 125,400 tons was 3,300 tons below actual consumption of 128,700 tons (based on data prepared April 25, 1957).

The forecast of demand in the steel industry, 48,000 tons, was 2,300 tons, or 4½% below actual consumption of 50,300 tons and the forecast of demand in other industries, 77,400 tons, was 1,000 tons, or 1¼% below actual consumption of 78,400 tons.

Outlook for Future Demand

Projecting the demand outlook to 1965 injects new factors into the situation. In the first place, normal peace-

(*Continued on p 226*)

BENCHING SYSTEM in Pacific pit, largest open cut in district. Originally ore and waste were mined on 20-ft benches. Discovery of additional ore at depth required restripping the footwall from original groundline on 15-ft benches. Average slope of benches after final stripping was 52 deg.

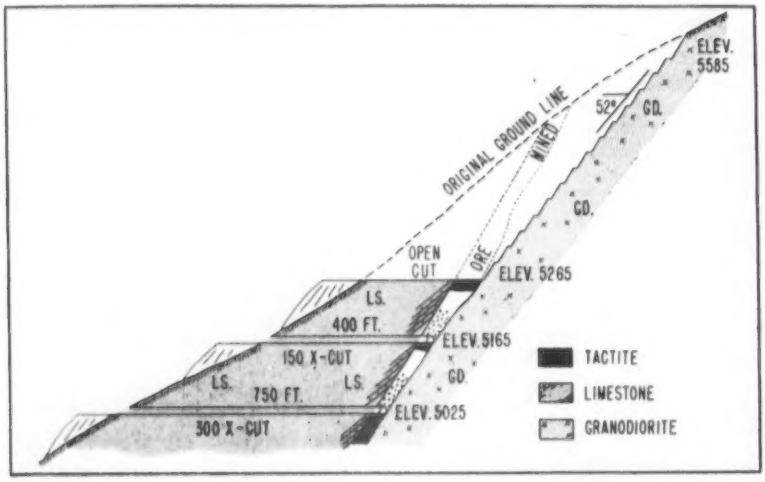
◄**THIS TERRAIN** is typical of Potosi mining district. Marcus pit in distance with haulage roads leading to it.

Mining Tungsten Deposits by Open Pit Methods Pays at Getchell Mine

WILLIAM J. NEWMAN

Mr. Newman is mine superintendent, Getchell Mine, Inc., Golconda, Nevada.

OPERATION OF A NUMBER of small open pits carries with it all the problems experienced in large-scale pit operations. At the Getchell mine an additional difficulty facing the management was the fact that character and size of the orebodies found in the Potosi mining district were unknown and their location was in rough and rugged terrain devoid of access roads. Need for tungsten was urgent after the outbreak of the Korean War, and it was by adoption of open pit mining that a quick supply of ore was made available for milling while underground mines were being developed. As a consequence, the Getchell mine was converted from a 1500 tpd gold operation to a leading tungsten producer in December 1950.



SECTION through Pacific pit, east-west, looking south, illustrates benching in open cut and shrinkage stopes of underground mine advanced to bottom of pit.

Economic grades of scheelite occur as a metamorphic deposit of tactite around the periphery of a granodiorite intrusion of sedimentary rock forming the Osgood Mountains in northeastern Humboldt County, Nevada. The tactite deposits are widely scattered from one to twelve miles from the Getchell mill, and at elevations up to 2,000 ft higher than the mill site. Bold outcrops of granodiorite, limestone, and

shale are evident throughout the range, and hillside slopes of 30 deg are not uncommon.

Metamorphism has altered the limestone adjacent to the invading granodiorite to a tactite along the contact where conditions of temperature and pressure were favorable. The chemical composition of the limestone seemed to be another favorable condition to form tactite, as the economic deposits in the area occur where the limestone is not highly silicious. No commercial deposits of scheelite have been developed where the shales or hornfels contact the granodiorite. Wollastonite is found near the contact and some argillite is interbedded in the limestone. The sedimentary rock dips generally 40 deg to the east on the eastern slope of the Osgood Mountains and the contact is also conformable to the attitude of the sedimentary series. The tactite is a typical metamorphic product containing garnet as the ground mass with quartz, epidote, calcite, chalcopyrite, pyrite, scheelite (calcium tungstate), and molybdenite.

Production Record of Pits in Operation from 1950-56

TONS

Name	1950	1951	1952	1953	1954	1955	1956	Total
Alpine	2500	41,200						43,700
Moly	2400	10,300				3100	8800	24,600
Tip Top		2700	8800	15,000	3100	7300	300	37,200
Kirby			25,000	9600				34,600
Top Row				2800				2,800
Riley Ext.				4500	23,400			27,900
Pacific		12,500	73,600	72,700	35,800	30,500	45,600	279,700
Marcus						7100	14,200	21,300
Totals	4900	75,700	107,400	104,600	62,300	48,000	68,900	471,800

Cost of Breaking, Shoveling, and Hauling

	1951	1952	1953	1954	1955	1956	Average
Primary breaking	0.21	0.29	0.19	0.38	0.36	0.19	0.27
Secondary breaking	0.01	0.08	0.12	0.17	0.28	0.15	0.12
Shoveling and hauling	1.80	1.70	1.69	1.48	1.65	1.46	1.64
Total	$2.02	$2.07	$2.00	$2.03	$2.29	$1.80	$2.03

Breakdown of Cost of Equipment Hauling Ore

	1951	1952	1953	1954	1955	1956	Average
Shoveling	0.39	0.43	0.44	0.45	0.46	0.40	0.43
Hauling	1.20	1.06	1.12	0.93	1.06	0.96	1.06
Tractor	0.09	0.09	0.03	—	—	0.03	0.05
Patrol	0.12	0.12	0.10	0.10	0.13	0.07	0.11
Total	$1.80	$1.70	$1.69	$1.48	$1.65	$1.46	$1.64

Pit Development

Open pit mining of the tactite ore was greatly aided by some of the physical properties of the deposits. Open cut mining would be a more correct description of the operations carried on, as no actual pits were established, only cuts in the steep hillsides as shown on p 90. In view of the ore dipping slightly steeper than the hillsides, greatest increase in stripping was in benching the footwall for safety (see photo). A mantle of decomposed granodiorite sand covered most of the hillsides below the tactite deposits and this aided materially the building of roads to the outcrops for exploration and mining. To reach the deposits, roads with necessary switchbacks and on a plus 10% grade were laid out with the aid of an Abney hand level. The road system leading to the Marcus pit and terrain are shown in one of the accompanying pictures. Temporary roads on grade for exploration were built with a D-8 Caterpillar crawler tractor equipped with an angle blade.

Development of an outcrop was done by stripping with a diesel power shovel or by diamond drilling, or a combination of both. If a shovel uncovered sufficient ore on the first cut, then trucks were sent in to commence haulage to the mill. The preliminary road was widened with the angle dozer and shaped with the motor patrol. In the winter after a severe snowstorm the angle dozer made a pass over the roads pushing snow, followed by the motor patrol pulling the decomposed sand from the bank with consequent sanding the roadbed. Heavy snows had very little effect on the operation.

Mining of ore from the outcrop was done in 20-ft benches. This bench height was also carried in waste stripping areas. Holes on the benches were drilled with wagon drills either vertical or flat, depending on the character of the ground. When the orebody was enlarged by diamond drilling in the largest pit operated, it became evident that the slope of the footwall of the open cut would have to be changed if the additional ore was to be recovered. Stripping was started at the top of the pit at the original ground line, with bench height carried at 15 ft. A berm of 5 ft was left as a catch bench sloping slightly to the bench wall; the average slope of the pit footwall was 52 deg. Broken ore was loaded into 15-ton Kenworth diesel trucks by 1½-yd Northwest shovels.

When stripping the upper benches of a new ore deposit preparatory to mining, the waste material was removed by casting with a shovel and pushed off the bench by a dozer. This procedure was repeated on each successive bench. As no trucks were used in these operations, their employment at other pits or for underground ore haul was made possible. As an orebody continued and benches became wider, new benches were started with the dozer working the outside edge down to grade of the next bench. As a consequence, new benches were started while ore was still being hauled from the bench above. Establishment of waste dump areas presented no problems because of the steep hillsides and convenient location with nearly level roads from the pit area. Waste boulders too large for truck loading were pushed off the bench by a dozer, thereby reducing secondary blasting of waste to a minimum.

A total of seven tactite deposits have been mined by open pits since 1950. Four other deposits were prospected with open pit equipment and contributed some development ore to the total tungsten ore obtained by open pit methods. Underground mining by shrinkage stoping is carried on under four of the seven pits mentioned. The name and production history of each deposit are given in one of the accompanying tables. All figures are estimated wet tons from the daily truck tally which were periodically checked by weighing the loaded trucks.

Rented Equipment

All open pit mining equipment was rented on an hourly basis from

Nevada Equipment Rental Co., Reno, Nevada. This arrangement offered several advantages—namely, (1) the mining company had no large investment in equipment at the beginning of the tungsten program which was uncertain in 1950 and no expenses for spare parts or maintenance; and (2) the rental company could offer a large variety of equipment that could be exchanged as mining progressed, thereby adding greater flexibility to the mining operation. The setup worked well for both companies as the physical characteristics of the ore deposit made a firm contract to haul ore and waste difficult on a tonnage basis. For several years there were in operation three 1½-yd diesel shovels and one 2½-yd diesel shovel, 14 trucks, three D-8 Caterpillar tractors, and one motor patrol.

Equipment was scheduled daily for loading and hauling ore and waste in the open pits or to haul ore from the underground mines, wherever the need was greatest for that day. In addition to this, the trucks were scheduled to haul tungsten concentrates from the mill to the rail head for shipment and rods and balls on the return trip. The D-8 tractors were assigned to pit maintenance, road building, or prospecting on a daily basis, whichever program was more important. The motor patrol maintained all haulage roads, camp streets, firebreaks, and the main road into the property from Nevada State Highway 18. Under this arrangement all available equipment rented was utilized to the fullest extent, with the rental company working its machinery units as steadily as if they had been on a contract basis.

Late in 1954, the rental company installed short-wave radios in the supervisor's pickup truck and one in the mine superintendent's truck with a base station in the rental company's office and a remote set in the Getchell mine office to further coordinate the equipment units. Use of radio communication between supervisors, shops, and offices improved the efficiency of pit work and haulage by reducing equipment downtime because of breakdowns or for the many other "breaks" that can happen in a mining operation.

Drilling and Blasting

All blasthole drilling in the pits was done with Ingersoll-Rand FM-2 and FM-3 wagon drills mounting DA35 drifters. Two FM-2's were used at the start of tungsten mining program and later replaced with two FM-3 units. The DA35 machines were chucked for 1⅛-in. round lug steel and threaded for an I-R series 118 thread. I-R 118xCS4 (shoulder drive, modified reverse buttress, 1⅝₆-in. OD thread) Carset bits were used to drill the hard rock formations encountered in the pits. The following Carset bits were used: A 2⅜-in. on the 6½-ft. starter steel; 2¼-in. on the 11½-ft. second; 2-in. on the 16½-ft. third; and a used 2-in. bit on the 21-ft fourth steel. Compressed air for each wagon drill was supplied by an I-R Gyro-Flo 315-cfm portable compressor.

To hold the amount of drilling to a minimum, blastholes were spaced on 15-ft centers and drilled to a depth of 21 ft. In general, flat holes were drilled in preference to vertical holes as the drilling was done more nearly at right angles to the bedding rather than with the bedding of the limestone. Also, when a new bench was made the roads to the old bench above were cut out, and it required considerable extra work to get the drilling equipment up on the old bench for drilling vertical holes.

Advantage of Flat Holes

Flat holes had the added advantage of permitting all work to be done off one bench. The size of the blastholes was held to a minimum, and even then only a maximum of five to six 21-ft holes could be drilled by a two-man wagon drill crew in one shift. Reasons other than hard rock at times were responsible for the 105 to 126 ft of blasthole drilled per shift. These included the long drive to the pits from camp, delays in starting the compressor, especially in cold weather, and time spent in secondary blasting at the pit site.

Additional men could have been employed, but the two-man drill crew in the largest open pit accounted for an average of 300 tpd of ore broken and at times up to three times that amount of waste. The reason for starting a blasthole with a 2⅜-in. bit was to allow the hose on the pneumatic powder loader to pass into the barrel of the flat holes so that the bag powder could be placed as near the bottom of the hole as possible. Otherwise, a new 2-in. bit followed by progressively used 2-in. bits could have drilled the entire hole, as there was very little loss of gage.

Drill records of the I-R bits used and mentioned show a life of more than 2,000 ft of hole drilled per bit under the most adverse conditions of hard wollastonite lime of the hanging wall, the tactite of the ore deposit, and the granodiorite in the footwall. This high bit life resulted in an average bit cost of about 1c per ft of hole drilled.

The success of the drilling and blasting operation depends upon proper springing of the blastholes. If the holes were in fractured ground and could not be properly sprung, then extra holes had to be drilled in order to take the proper ratio of powder for breaking the block of ground. In general, the limestone and granodiorite waste and tactite ore was solid and sprung very well, with very few holes lost. Blastholes were sprung for the proper ratio of powder in place in place of drilling a large number of holes because of the cost of drilling and the time consumed in drilling the hard rock formation.

Usually, the blastholes were sprung twice, but in very hard rock formations they were sprung three times. The first spring was effected with four of five 1⅛ x 8-in. Herculite IX, 60% stick powder. Water was used for stemming both the vertical holes and the flat holes, as latter were inclined slightly down. Where the formations were fractured, empty powder cartridges supplied by the Hercules Powder Co. in any desired size were filled with decomposed granodiorite sand and used for stemming The holes were sprung by one of the wagon drill crew as the drill was advanced along the face, with the first spring nearly complete when the face was drilled out. This also allowed the rock to cool sufficiently before the second spring. Use of water as stemming shortens the cooling period somewhat, but in any event at least one hour should be allowed as a cooling period in solid rock formations.

For Safety

Compressed air can be blown into the hole after springing for additional safety. The second spring consisted of from 20 to 25 sticks of Herculite IX, 60%, 1⅛-in. stick powder, and by measurement on the loading stick if this does not provide a satisfactory chamber or pocket, a third spring of 80 to 100 sticks may be required. These figures are for the average formations encountered in the Potosi mining district. There have been occasions in solid rock where a third spring consumed a case of powder or about 160 sticks.

Loading flat holes with Herculite 40% free-flowing bag powder was accomplished by use of two types of pneumatic powder loaders, of which the oldest type and most used was a two-bag closed unit made by Pneumatic Loading Machine Co., San Francisco, Calif. The loader was well grounded for safety, and a pressure regulator was available to keep pressure going into the loader at 25 lb maximum. The second pneumatic powder loader used was of open design of one bag capacity manufac-

tured by T. H. Hook, of Walnut Creek, Calif.

The bag powder was primed near the bottom of the blasthole with several sticks of Gelamite IX, 60%, 1⅛-in. powder, using a no-delay electric blasting cap with a 24-ft copper wire lead. Bag powder was loaded into the pocket at the bottom of the hole with the pneumatic loader and stemmed tight to the collar of the hole. The closed type loader had a 30-ft, 1-in. rubber air hose attached to a 15-ft. brass or copper tube, 1 in. outside diameter and ⅞-in. inside diameter, while the open type unit used a 20-ft, 1-in. copper tube connected directly to the cone container holding the bag powder. Electric cap leads connected in series were attached to a 50-cap plunger-type blasting box by a 500-ft length of duplex blasting wire. In general, not more than 10 holes were blasted at any one time.

Powder ratios of from ¼ to ½ lb. of 40% bag powder per ton of ore and waste broken was sufficient to produce good primary breaking. A ratio of ¼ lb. was used when breaking relatively soft or fractured ground found near the surface, and the ½ lb. figure in solid rock with very few slips or seams. In calculating tonnages of either ore or waste, a figure of 10 cubic ft. per ton of rock in place was used.

Loading and Hauling

Each operating pit was served by a 1½-yd. Northwest Model 6 shovel and 3 or 4 Kenworth 15-ton trucks powered by 200-hp diesel engines, depending on whether ore or waste was being hauled. For a period a 2½-yd. Northwest Model 80D shovel was rented for additional stripping in the largest pit. Extra trucks were required daily to haul ore from the underground mines to the mill, and they were loaded by a special slusher installation (see *E&MJ*, January 1957).

The trucks mentioned proved satisfactory for the type of long up-and-down grade hauling required in the district. They were equipped with Spicer-Brown-Lipe 7841 main transmission and a Spicer-Brown-Lipe 703 auxiliary transmission to 7⅝ dual drive axles. Firestone 1100x24 rock lug tires at 75 lb pressure were used the year around. New tires were mounted each year at the beginning of the snow season to cut need of chains to a minimum. Rock gates were installed on the truck beds to handle large boulders, especially waste, thereby reducing the amount of secondary blasting

As the stripping ratio increased with depth in the Pacific pit, the largest of the seven open pits, Euclid Model F 15-ton trucks powered by 200-hp Cummins Diesel engines were used to remove waste from the pit. These units were well suited for loading large waste boulders and for the short haul to the waste dump. An added safety feature serving truck and driver on the 10% downgrades was the installation of a Williams compression brake by Power Brake Equipment Co., of Portland, Ore. The unit is mounted on the exhaust manifold and acts as a compression retarder to hold back the truck. In addition to the safety factor and reduced truck maintenance because of less gear work during downgrade haul, the device has increaded daily tonnage hauled by 25%. On long downgrade hauls the trucks can proceed more than one gear faster from second underdrive to second direct drive, making possible one extra trip per day per truck. At one pit, the three loads per truck per day were stepped up to four, with time to spare for an extra load of ore from an underground mine near the mill.

Maintenance

Minor repairs and service to equipment was done on night shift to minimize the number of units required. Preventive maintenance operations included daily inspection and servicing all equipment units. Truck service was scheduled at 50 hr for lubrication and tire check. The check at 100 hr covered lubrication, oil change, tires, and maintenance. Daily records were filed of all major and minor repairs made to each unit to become a permanent record of the equipment. To prevent minor repairs from causing downtime of equipment, daily "cries" of the operators relating to unit operated were checked on night shift. All major equipment overhauls were done in the rental company's Reno shops, and repairs to motors, transmissions, and rear ends were done in the field on a unit exchange basis. All field units such as shovels and tractors were serviced by a ¾-ton Chevrolet pickup truck with a closed body housing the following equipment: Air compressor run by power takeoff from transmission, air receiver, Lincoln high-pressure lubrication gun with 100-lb. trac roll all season grade lubricant, a single panel Ray automatic heater using low-pressure gas for quick and easy field service in sub-zero weather. In the night truck parking area, twin control 110 v hot lines with plug-in type hot water heaters were installed to insure quick starting of trucks in cold weather.

Cost of primary breaking, secondary breaking, and shoveling and hauling for period 1951-56 is given in the table on p 91. All figures are in dollars per estimated wet ton of ore produced by open pits.

A further breakdown of equipment when engaged in loading and hauling ore produced the figures given in another table. Again a 6-year period is involved and figures are in dollars per estimated wet ton of ore produced by open pits.

The high cost of loading is prominent in this table, but it must be remembered that the pits producing the largest tonnage were from 7 to 12 miles from the mill. The trucks could be loaded in a few minutes and a round trip required from one to two hours, the shovel cost continuing even though the unit was idle waiting for the return of the ore trucks. The obvious solution would have been more trucks, but the tonnage was not high enough to keep a truck under the shovel at all times. Also, some secondary blasting had to be done between truck cycles. Tractor and patrol costs are for maintaining ore haulage roads and reflect years of heavy snow.

Stripping Estimates

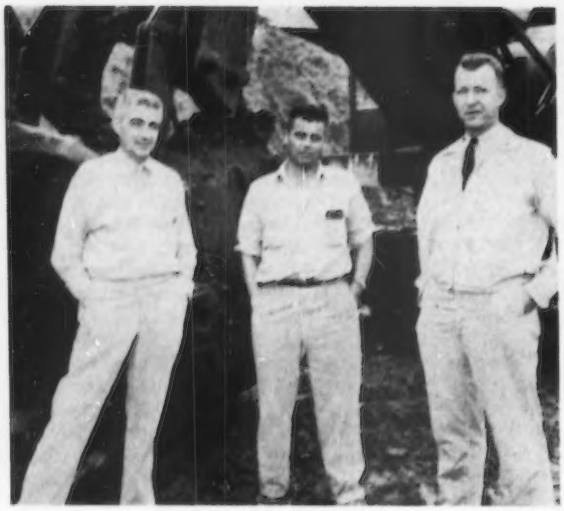
Stripping costs can only be estimated because the dozer pushed an undetermined volume of waste when stripping in the pits. The best estimate that can be made is from the daily truck tally and eliminating the dozer costs while stripping. This results in a cost of about 60c per yd or 30c per ton. Cost of stripping is high as much of it was done under adverse conditions especially when starting a new bench on steep hillsides and the trucks had to back into the shovel before the bench was wide enough for turning around.

You Can Get More Mileage Out of EM&J

Most recent mention of Getchell Mine was in April 1957, when Mr. Newman discussed reduction of underground drilling costs.

This article, and *E&MJ*'s other articles, as they appear during the year, are designed to work with the annual mid-June Guidebook issues.

For further background on the methods described in this article, check Guidebook 1957 pages 68 through 74.



PACIFIC ISLE'S president, general superintendent and general manager—Harrison, Tuomala and Boentje at a working pit.

ST. PAUL MINE conversation also involves mine foreman William Hansen and Tony De Nucci, superintendent (center.)

How to "Work Out" Iron Mines—Twice

WHEN HUGH HARRISON returned from a Pacific isle at the end of World War II, he came armed. His principal weapon was an idea, to organize his own company to mine, process and market iron ore. He also listed a background in the Lake Superior iron district where his father, Perry G. Harrison, was already well established in the industry; a friendship with John Boentje; a well thought out plan of operation for peacetime production and a name for the company—Pacific Isle.

Out of The Dream

Today the company is well out of the dream stage, is one of the Iron Country's leading producers, has contributed some interested technology (*E&MJ*, January 1954, p 89), and ranks John Boentje as vice president and general manager in charge of operations.

In '46 there were twelve strong, long established and well organized mining companies operating on the Mesabi and Cuyuna Ranges of Minnesota. All had furnace connections for handling the ore they mined. They had capable and experienced managements, well trained employees and strong financial backing. Among them were such well known organizations as Oliver Iron Mining Co. (U. S. Steel Corp.), M. A. Hanna Co., Pickands Mather & Co., Inland Steel Co., Cleveland-Cliffs Mining Co., Jones & Laughlin Steel Corp., Republic Steel Corp., Evergreen Mines Co., Butler Brothers and International Harvester Co.

TREASURER since the company's early history is old friend Don Keeler.

There were also seven so-called "smaller" companies—no weaklings—that had taken full advantage of the insatiable war-created demand for iron ore. They all had become firmly established.

All of these companies—large and small alike—were alert for acquiring any available property that held iron ore or offered a fair chance of containing it. The larger companies held extensive reserves of iron ore lands.

There was, however, one phase of the situation that had received little consideration. During the years before World War I and between Wars I and II, consumption of iron ore had been relatively low. Furnaces could be—and were—most exacting. They would accept only the best ores: high in iron, low in silica and moisture and with a small percentage of fines, that is, a coarse structure. During those years, and under those very selective conditions, many mines—open pit and underground—had been worked out by their operators.

The Definition

A commercial body of ore—if it be large or small—has been defined as one that can be "mined and sold at a profit." Under this realistic definition many of these old mines *had* been exhausted and the leases had been given up or had expired. Most of them were considered of little value—even by those who owned them in fee.

But, after two World Wars had exacted their toll from the Lake Superior area's great deposits of iron ore, the high grade, direct shipping ores had been steadily depleted. During the years 1941 to 1945 inclusive, Minnesota's three iron ranges—the Mesabi, Cuyuna and Vermilion—had provided approximately 338½-million tons of iron ore which had gone mostly for war purposes—and gone forever. Unlike iron and steel used in peacetime, that which is consumed by war leaves little salvage behind in the shape of recoverable scrap. And

of the more than ½-million tons furnished by Minnesota mines during those five war years, 244,299,000 tons came from its very best, direct shipping ores. The Mesabi Range alone mined 316-million tons of Minnesota's total. These figures do not include the production from the "old ranges" in Michigan and Wisconsin. Because of this wartime depletion of high grade ores, together with higher costs for labor and materials, iron ore prices had been rising. Furnaces, now, were forced to accept ores with higher silica, higher phosphorous or moisture and of a finer structure; ores that, only a few years before, they would have rejected summarily.

This had created a situation which determined Hugh Harrison's course when he returned to the Mesabi Range.

He reasoned that during all those years when the big steel plants had refused to receive any but the highest grade ores, there must have been left unmined a great amount of ore which had no market at the time, but could now be utilized profitably.

Confident that this was the solution to his problem, his embryo Pacific Isle Mining Co. leased three abandoned properties: two which had long been considered "exhausted" and one showing an estimated 8,484 tons remaining—too little, in itself, to be worth mining.

The University of Minnesota Mining Directory—issued annually—gives the important statistics of every iron mine and mining company in the State. The issue covering the year 1946 contains the first listing of the Pacific Isle Mining Co. and its three scrawny mines. This ill-favored trio of abandoned and neglected properties, with a mere 8,484 tons accredited to the group, constituted the new company's sole ore supply in that first year of its life.

Capital Minimum

No iron ore company was ever organized with less capital. Money was as meager as ore. It consisted of $2,300 of Harrison's savings, supplemented by an advance of $40,000 on prospective future shipments of ore.

The Pacific Isle personnel listed in that 1946 Directory consisted of just three names: Hugh Harrison as president and general superintendent, Arne O. Tuomala as foreman in charge and John A. Olson as master mechanic—these two men, incidentally, are still with Pacific Isle. Harrison was his own engineer, planner and salesman. Don Keeler, present treasurer and office manager, took care of the accounting work on a part time basis in those early years.

The ore loading for that first year (1946) was done by a small contractor (there was far too little capital to purchase equipment) who owned a little shovel and two trucks, which were almost as exhausted as the mine. Total shipment for the year was 276 tons of ore from one of the "exhausted" mines. But Pacific Isle was on its way.

Nine Old Mines

During 1947, Pacific Isle accumulated leases to six other properties: four of them listed as "exhausted," and two barely clinging to life with 10,000 tons each of "estimated available ore," Added to the 8,484 tons of its first three "has-beens," this made a total of 28,484 tons in the then group of nine old mines. Nevertheless, in 1947, Pacific Isle, from six of these bony properties, produced a remarkable 115,872 tons! The Mining Directory still carried only three names under the list of company officers—an office manager having taken the place of the master mechanic When the Bulletin for the year 1948 appeared, two more mines had been added to Pacific Isle's list. One, the Cyprus, was indicated as "exhausted" and had been for more than twenty years. The York, however, had a record-breaking (for Pacific Isle) 76,795 tons of ore available as of May 1948. This was the largest tonnage shown in any property the company had obtained up to that time. By stripping from a body of lean ore which could be beneficiated, it has turned out well. In six years the mine shipped 608,702 tons. It was obtained when, at the expiration of the old lease in 1947, Pacific Isle—still living up to its reputation "calculated risks" —overbid a neighboring operator in royalty per ton offered for the ore remaining.

Two new men, both superintendents, were added to the company's personnel as shown in the Bulletin for 1948. Shipments for that year were 174,104 tons—a healthy growth over 1947. From that time on, Pacific Isle's development in properties leased, in ore shipped and in men added to the management list was rapid. In 1949, shipments had increased to 277,286 tons. In 1950, with 15 leases—seven shown as exhausted—and six men under management, output jumped to 441,536 tons.

In 1950 occurred what Harrison considers the most important single event in Pacific Isle's history. The four year old company had developed to the place where one of the country's best known steel companies was interested in acquiring an ownership interest.

Inland Steel Company of Chicago with mines in Minnesota and Michigan and—later—in Canada, made this arrangement. In Harrison's words, Pacific Isle acquired "respectability, a market and capital."

In all fairness it should be recorded that any company that had grown from a 276-ton shipment in 1946 to 277,286 tons in 1949, had no reason to feel out of place among those older concerns which had acquired "respectability" during the lush years when a mine that contained from five- to ten-million tons was only an average one.

1956 marked the first year of Pacific Isle Mining Co.'s second decade of phenomenal growth. The 276 tons of its 1946 season had become 1,317,637 tons—a total that far exceeded that of any of the original seven "small" companies still operating. It also was considerably more than was shipped by two of those remaining of the twelve older and larger companies. The production records for the 1956 Lake Superior District list twenty-one operators—seven of which shipped in excess of one-million tons—Pacific Isle was one of the seven.

During the years since its organization, the company has excavated approximately 7-million cu yd of surface and 1¼-million cu yd of rock to uncover ore materials for mining. It has mined about 10-million tons of iron ore material—most of which required some sort of beneficiation—to produce 5-million tons of saleable ore. These operations have been performed in about 70 different work places.

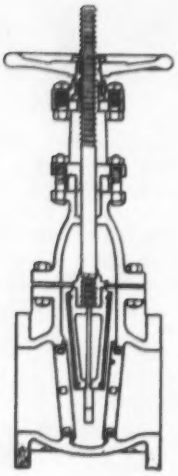
4,000 Acres Today

The company now controls, principally through leases, about 4,000 acres of potential ore lands, nearly all of which have been previously worked out and abandoned by other operators. It has four iron ore processing plants and employs from 300 to 500 men who operate between 100 and 200 units of mining equipment, such as shovels, trucks, tractors, road patrols, drills and other units.

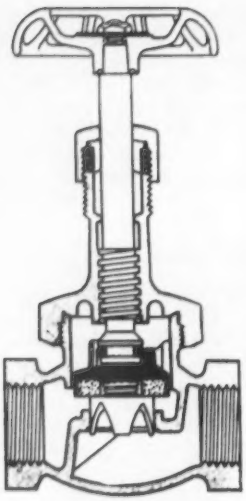
Among the 53 properties listed under Pacific Isle management in the 1956 Bulletin, 15 are called exhausted and 5 "inactive."

Personnel now includes a vice president and general manager, an assistant to the general manager, a treasurer, legal department, general superintendent, mineral development engineer and an engineering department.

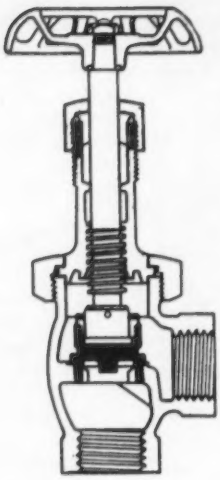
Iron Country observers now agree that when Pacific Isle lists a mine as "exhausted" there can be no doubt about it.



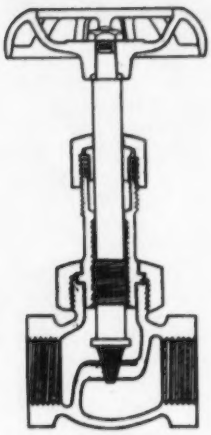
GATE
Outside screw & yoke (os&y) has a rising spindle and double disk taper-seat for sealing



GLOBE
One-piece bonnet, renewable composition disk helps this valve stay tight a long time



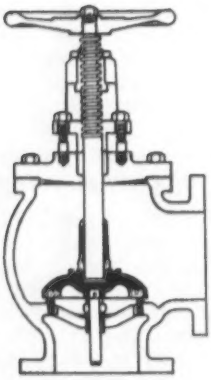
ANGLE
Union bonnet and regrinding bevel-disk. Save fittings by putting these at elbow spots



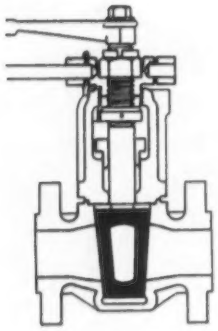
NEEDLE
Union bonnet with a stainless steel disk assures a tight closing and long wearing seat

(Courtesy Power, a McGraw-Hill Publication)

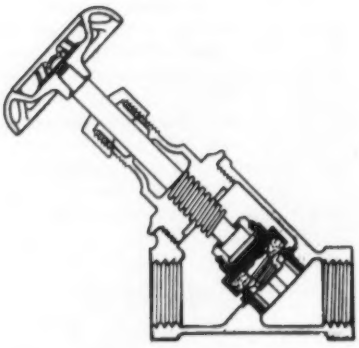
Refresher on Valve Selection and Care



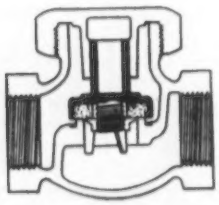
STOP CHECK
With stem open, disk opens by itself to equalize pressure, closes as check



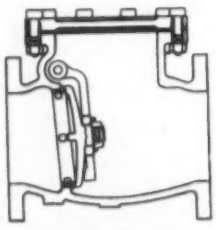
PLUG
Stick-proof plug valve is loosened before opening or closing, then tightened



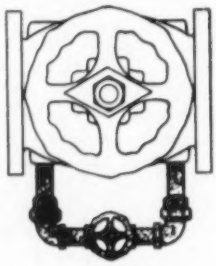
Y TYPE
This has all good features of a globe valve but offers less resistance to flow



CHECK
One-piece cap and renewable composition disk prevent back flow in the pipeline



SWING CHECK
Bolted cover, requiring disk in larger type, is used in a horizontal pipeline



BYPASS
Prevent wiredrawing the large valves by running small equalizing line, as shown

H. L. CUMMINGS
H. L. MARSH

EVERY MINING COMPANY invests thousands of dollars annually in valves handling everything from air at the mine, through slurries at the mill, to corrosive acids at the refinery. Proper selection of valves, their materials of construction and their applications, and careful installation and maintenance practice can go a long way in cutting your company's valve bill. The following notes are intended simply as a brief refresher for mining men on good valve practice.

Valve Materials

Valves are usually made of brass, bronze, iron or steel. Confining our discussion for the moment to steam, cold water, oil and gas, each metal is generally satisfactory so that selection of material would be based on cost or what is available. There are some limitations dictated by three factors; temperature, pressure and volume. Brass cannot be used above 550 deg F. Bronze will handle fluids up to 700 deg F at pressures below 350 psi. Brass and bronze valves usually do not come in sizes larger than 3 in.

Above 3 in., iron can be used if pressure is below 250 psi and temperatures are below 500 deg F. At higher temperatures and pressures, steel valves are needed.

Fourth factor in selecting valve material is the nature of the fluid to be handled. How corrosive is it? The question applies to the main body, or shell, of the valve and to the trim, such as seats and spindle. A fluid which will slightly attack the metals commonly used in valves can often be handled if proper material is used in the trim. For instance, cast iron becomes rusted in contact with water, but a cast iron valve with brass trim is ideal for water service.

Corrosive liquids, which the mining man encounters more and more with the growing application of chemical metallurgical techniques, may require special materials such as stainless steel, porcelain, or any variety of special alloys or even plastics. Valve manufacturers can make recommendations for most services. If you have a unique situation, it's a job for the metallurgist.

Which Valve Where

Getting the right valve for the job not only improves operational efficiency, but also cuts maintenance costs. Here is a rundown of common valves, where they are used, and what their limitations are.

Gate valve. Probably the most widely used of all types of valves, the gate valve is designed for tight shut-off and full free flow. Raising or lowering the disk or gate requires too much time for a quick opening or closing operation and flow control by partially opening the gate is too poor for adequate throttling. Moreover, throttling causes severe wear to the seating surfaces.

Globe valve. Widely used for flow control, the globe valve requires little movement of the disk from full open to full close. This quick response in flow volume is achieved at the cost of increased resistance to flow in this type of valve design. Wear caused by throttling is easily taken care of by replacing or regrinding disk and seat.

Angle valve. Similar to the globe, the angle valve also serves as a 90-deg turn in the pipe line. It offers less resistance to flow than the globe.

Y valve. Frequently used for blowing down boilers, the Y valve has all the handy operating features of the globe valves and offers less resistance to flow.

Needle valve. Used for close control, the needle valve is similar to the globe but has a tapered disk which fits accurately into its seat for extremely tight shutoff with little effort.

Check valve. Used for preventing back flow or to keep fluid in a line when the pump has been shut down (foot valve), the check valve comes in two basic types; swing and lift. In the swing check, the disk is hinged and the valve is placed in the line so that the flow keeps it open. When the flow stops, the disk swings closed. The valve will operate vertically or horizontally and should be used in series with a gate valve.

In the lift check valve, the flow holds the disk off its seat. When flow stops or is reversed, the disk falls to its seat and is held there by backflow, if any. The lift check can be obtained in a horizontal, vertical or angle valve and is usually used in series with a globe.

Check valve operation is automatic, but a guaranteed source of embarrassment is to install a check valve backwards.

Stop check. A special type of lift check is the stop check which has a stem and handle. Stem is not connected to the disk and acts only as a wedge to hold the disk down.

Plug valve. For quick opening or closing, the plug valve or cock has a tapered plug with a hole through it. Open, the hole lines up with the pipe for full flow; closed, in a quarter of a turn, the hole is perpendicular to the pipe line. Plug valves can handle thick or dirty fluids but require regular lubrication and packing inspection to keep them tight and yet easily opened and closed.

For Longer Valve Life

Most valve failures can be prevented before they occur. To prevent failure and insure proper and efficient operation, valves must be properly selected, correctly installed and have adequate inspection and experienced piping maintenance. We've discussed selection, now here are some useful "Do's and Don'ts" for installation and maintenance.

1. Don't use a wrench on the hex away from the joint. A twisted body may be the result. Do use your wrench on the hex near the joint. This gives support to the valve and prevents possible damage.

2. Don't install a valve while it is in the open position. Do install it in the closed position. The chance of twisting it is lessened when closed.

3. Don't install a valve so that it will be forced to carry the weight, sag, or expansion of the piping. Do use proper supports and expansion bands or joints. This will relieve any undue weight on the valves.

4. Don't cut overlength threads on a pipe to be screwed into a valve. The pipe may shoulder against the valve seat and injure it and the joint may not be tight. Do thread the pipe to a standard length. The joint will then make up tight before the pipe end strikes the seat.

5. Don't apply joint compound to the end threads of a valve. Do put joint compound on the pipe threads and it won't get on the valve seat to collect grit or scale.

6. Don't install dirty or rusty pipe or operate a new or altered line until it is cleaned of chips or dirt. Do blow out or otherwise clean the inside of the pipe before installing, and blow out new or altered line before putting it into service. Valve seats are easily ruined by dirt or chips.

7. Don't use a strong lever and a strong pull on a screwed joint. Serious twisting may result. Do use a short lever and a few taps with a hammer. This is far more effective and won't twist the valve.

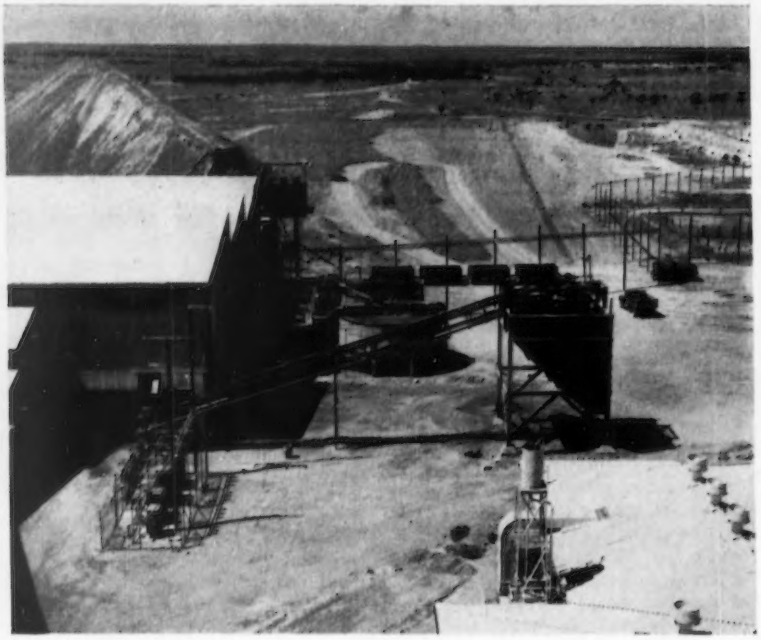
8. Don't try to re-assemble a valve without full knowledge of its construction. Do consult your catalog reference sheet and thereby eliminate the chances of ruining the valve and consequent costly shutdowns.

9. Don't force a leaking valve. More valves have been ruined by force than

(Continued on p 106)

Mr. Cummings is plant manager and Mr. Marsh is chief engineer with the R-P&C Valve Dv., American Chain & Cable Co., Inc.

AVERAGE 9% ORE is hoisted from Radium Hill. Mine is the only underground uranium mine in Australia.



MILLING ECONOMY is due to the nature of the mine's davidite ore, which, while highly refractory is easily crushed and separated from titanium and iron oxide content. Concentrate is shipped to Port Pirie for ion exchange processing.

Radium Hill Mines 9% Uranium Oxide

"THE OLD LADY" of uranium mining, Radium Hill of South Australia, is now firmly settled in her new life, with all the trappings and appearances of a bustling mining community. The property ranks among the oldest uranium producers in the world and was closed down in the 1900's when the great world medical demand was for radium.

Following United Kingdom and U. S. Atomic Energy Commission pressure in 1944, Radium Hill once again started production, with a firm market for its current 450,000-lb uranium oxide annual production. Total cost of the project was over $15-million, with $3.3-million expended for the reduction plant at Port Pirie, where yellow cake is produced.

Ore Is Davidite

Ore is a highly refractory davidite, which is mined underground at Radium Hill and crushed at the mine. Mine shaft, now being extended to 1300 ft from the 850 level, hoists the 9% U_3O_8 ore to the surface, where a heavy media system recovers the oxide. Titanium and iron oxide content of the ore is reduced.

Concentrate is shipped over an 11-mile rail spur to the main line to Broken Hill, for the 200-odd mile run to Port Pirie. At the Port, where acid, salt and water are plentiful, the highly refractory ore must be treated up to 10 hours with sulphuric acid to free the oxide. Following separation and purification, the yellow cake travels on a stainless steel belt through a dryer at 500 deg F, and is then discharged through a chute into 500-lb drums for shipment to Britain and the U. S. for conversion into pure uranium.

YELLOW CAKE from ion exchange chambers is sent along stainless steel belt through 500 deg F dryer before loading into 500-lb drums.

Australia has hopes for its own uranium-consuming reactors in the "not distant future," based on the promise of the vast interior, now held back by lack of power and irrigation. Contract with the Combined Development Agency (U. S. AEC and U. K.) runs into 1962.

Domestic Reactors

A leading Australian physicist, Prof. Marcus Oliphant, envisages future establishment of nuclear power stations on Spencer Gulf not only for generating electric power, but also to distill sea water and pump it inland to arid areas in the north. In preparation for such a future day, the government is sending technical staff members to British atomic energy establishments for training.

In a little more than four years of revived mining, Radium Hill has become home for a population of about 880 in a town of 124 homes, well apart from the mining operations. Even the 200 or more single men,

many recent immigrants from Germany and Italy, have settled into the community life. Labor turnover is reported to be much lower than in most mining settlements. The town buses run on schedule, the train arrives over the spur from the main line three days a week with fresh food. Guinea Airways, which serves this area, flies in twice weekly, circling while the "roo patrol," clears kangaroos from the landing strip.

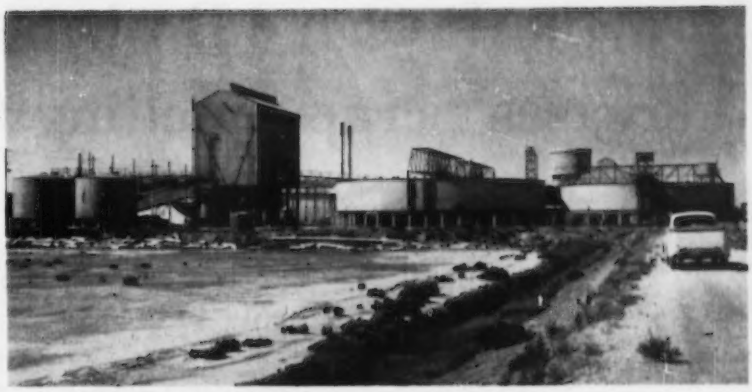
Homes are solidly built as the mine is expected to be operating for a long time. They are all electric, each equipped with refrigerator and electric range. Power is supplied over a high-voltage transmission line from Morgan on the Murray River, 125 miles away. Early water supply was from excavated earth dams and tank trucks covering 25 miles. Now, water is piped 53 miles from the Umberrumberka Reservoir. The line furnishes 1,250,000 gal a week. If that supply should become insufficient, reservoirs can be tapped at Menindie on the Darling River, 75 miles from Broken Hill.

Fixed Prices

A general store is operated by the State Mines Department to hold prices of fresh meat, bread, vegetables and groceries down to capital city levels, elsewhere in Australia. A power in the community is the Radium Hill Social Club, Inc. The elected president operates a pneumatic drill at the 700-ft level. Fellow members include a carpenter, shift boss, underground sampler, mining engineer and a clerk. The community superintendent, a kind of State government welfare officer, is a permanent member of the committee. The club is a "mouthpiece" for the town, organizes social events, and operates the open-air movie, a recreation hall, a canteen, billiard room, library, civic hall and a new £10,000 ($22,500) swimming pool, built largely from profits of the canteen, which serves nothing stronger than beer, at three two-hour sessions a day. With the State-operated general store, the town has a small hospital, staffed by the Australian Inland Mission nurses and visits by the Flying Doctor Service; a school, post office, police station, piece goods and dress shop, hardware store, two churches—no hotel.

Terrain around the Radium Hill installation is Australia's famed "saltbush," rolling clear to the horizon on all sides.

Photos and background information for the article on "The Old Lady" were supplied to *E&MJ* by the Australian News and Information Bureau.



PORT PIRIE plant has nearby sources of water, acid and salt. Some 450,000 lb of oxide is produced annually at the $3.3-million reduction facility.

ION EXCHANGE section of the Port Pirie plant is checked by a metallurgist. Rubber-lined tanks contain the synthetic resins used to gather precious concentrate.

GARDENER'S WAR against climate and soil appears to have been won by Mr. and Mrs. Norm Gilberthorpe. The mine manager has coaxed a lawn from the desert soil.

How the Inverted-Bosh Blast Furnace Increases Scrap Smelting Capacity

THE FIRST INVERTED-BOSH blast furnace designed by John S. Stewart was installed under his direction at Franklin Smelting & Refining Co., Philadelphia, Pa. Inverting the bosh on an existing furnace, raised Franklin Smelting's copper-scrap smelting capacity from 35 to 100 tpd charge. At the same time, coke consumption dropped from 25 to 10% of the charge.

After five years of successful operation, the improvised furnace was dismantled and a new furnace, 53½ in. in diameter at the tuyere level, with modern auxiliary equipment was installed. Elimination of crusts, arches and the usual troubles inherent in smelting scrap in a blast furnace, the increased tonnage, the low temperature of top exit gases and the low coke consumption, all encouraged Milton I. Schwab, vice president of the company, to make the change. The new furnace has been in operation since Sept. 14, 1953.

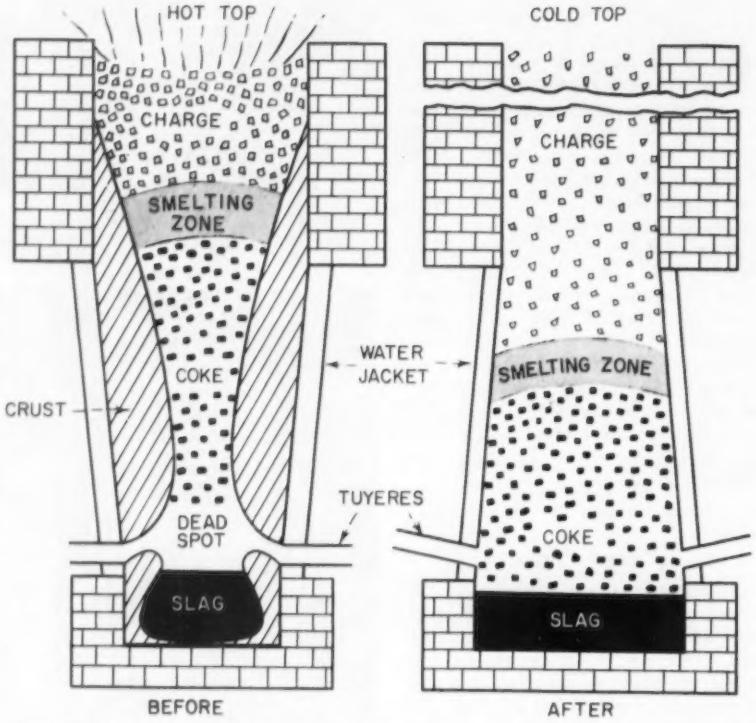
Since this new installation, the furnace daily charge has run close to the January average of 163 tpd. For example, here is the charge data for six days in January 1957:

Date	Tons
Jan. 14	165.84
Jan. 15	175.75
Jan. 16	189.82
Jan. 17	175.62
Jan. 18	161.85
Jan. 19	170.05

The blast furnace charge now runs 93.9% scrap copper and copper-bearing sinter, plus 6.07% coke. Franklin Smelting buys the poorest grade of irony copper brass scrap and residues which usually run high in cast iron and fines, with much of the charge in the form of brass turnings, old wire and large blocky chunks.

Fines are sintered, then sent to the furnace, where they are screened out of the charge and returned to the sintering charge piles. Franklin Smelting breaks large pieces and sinter to maximum 12-in. size.

Keeping the fines out of the charge of any blast furnace will reduce crusting, accretion build-up and speed up the smelting rate. Excessive fines will plug the charge in the shaft and prevent the even flow of the ascending gases, thereby causing high-pressure hangs. At Franklin smelter, the sloping furnace feed-chutes from the hoist dump hoppers have built-in screens that sift out much of the fines, which are returned for resintering. In addition, an encircling dust-bin around the furnace shaft reclaims the fines blown out of the shaft.



INVERTING THE BOSH keeps the smelting zone within the bosh, limits crusting.

Tuyeres on the blast furnace are at right angles to the jacket and direct the blast down toward the hearth. With sloping tuyeres and liberal depth between tuyere plane level and the top of the hearth, no trouble is ever experienced by slagging tuyeres. Gentle punching with a ½-in. rod is all that is required.

Maintaining the Coke Level

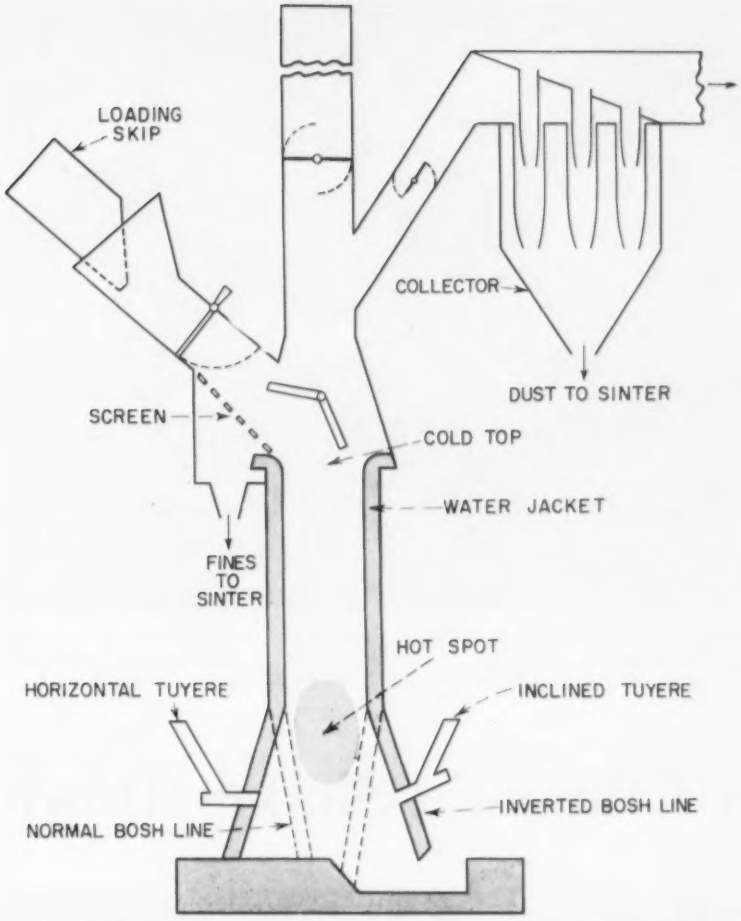
The coke reservoir is maintained 3 ft deep above the tuyere plane. If it burns down to less than 3 ft, an extra small shot of coke is added to restore the level. Capping the top of the reservoir is the smelting zone which graduates from just melting to the plastic state. As the slag and metal melt, they trickle down through the hot reservoir and become superheated and very fluid before reaching the crucible.

Unlike other blast furnaces smelting brass scrap, the Franklin furnace has never experienced a hot top. It looks cool enough to walk on. Also, there are never any "blow holes." The gases blowing from the top of the charge column are evenly distributed over its entire cross-section.

Pressure at the bustle pipe is maintained at a maximum of 30 oz; as each charge has a different density. Franklin smelter varies the charging level to keep the pressure nearly constant. Air is delivered at 140 cfm per sq ft area at the tuyeres.

Slag and metal are tapped together periodically from the furnace to a small reverberatory. Slag and copper are tapped from the reverb as necessary. Copper is tapped and granulated by a stream of water from a 4-in. pipe, with water and copper granules dropping into a pit near the reverb. The slag is also granulated at the top of the slag launder which then passes to the slag pit.

On an inverted-bosh blast furnace, the upward and inward slope of the jackets inhibits formation of accre-



PLACING TUYERES at right angles to the bosh directs the blast toward the hearth.

tions. Molten slag, or the semi-plastic material of the smelting zone will not adhere to the jacket's inwall, gravity works against it. Further, unlike the boshed furnace, some of the hot gases from the coke reservoir at the bottom of the jacket impinge or flow against the jacket's inwall and continuously melt away any particles that may adhere to it. With Franklin's old regular bosh jacket, their upward and outward slope promoted formation of accretions, which grew and grew until there was only a small hole at the bottom. A coke arch formed a short distance above the tuyere plane level, creating a hollow space below. When the slag and metal from the smelting zone, located high in the shaft, trickled through the coke and into the hollow space, they were subjected to the chilling action from the air blasts which transformed them to a cold and sticky state, causing difficult tapping and launder flow, and tending to cause slagging tuyeres.

The wide diameter at the tuyeres of the inverted-bosh jackets allows for large number of tuyeres, large quantities and even distribution of air. Wide diameter and adequate height between tuyeres and bottom of jacket provide large storage space for slag, and good settling—hence, less metal loss in the slag. It also extends the time between taps. These features, with the slanting tuyeres, prevent tuyere slagging.

To get efficient and complete combustion of coke in a blast furnace, one must have sufficient diameter at the tuyeres, high temperature, high pressure and an adequate volume of air. The inverted-bosh furnace has sufficient diameter at the tuyeres to complete the combustion reactions; i.e., burning to CO_2, then converting to CO; also, as the jackets have a restricted area at the top, the gases in the chamber are compressed, which gives high pressure and high temperature to the gases in the chamber. As a result, there is a large coke reservoir at the bottom of the chamber, a depth of not more than 3 ft under fairly high pressure and very hot temperature. Overlying the coke reservoir is the smelting zone which, being low in the furnace, has a large area, is probably not over a foot thick and is well down from the top of the jacket, so the plastic zone does not approach the narrow shaft. As a result, slag tapped from the furnace is superheated, easy flowing and well reduced. The copper in the slag analyzes 0.8 to 1.1%.

The shaft of the inverted-bosh furnace is relatively short compared with the tapered jacket below it and is of small diameter. It is charged from the chute or chutes from the dumping hopper of a simple hoist-car. The small diameter of the shaft insures against segregation of the charge.

The shaft diameter should be sufficient to pass interlocking chunks. The descent of the charge in a small diameter shaft is very rapid. As all furnace gases pass through the charge column in the shaft, velocity of the gases is high but evenly distributed over the whole cross-section, and there are no "blow holes." Much of the dust in the charge is blown from the furnace, collected and sent to sintering.

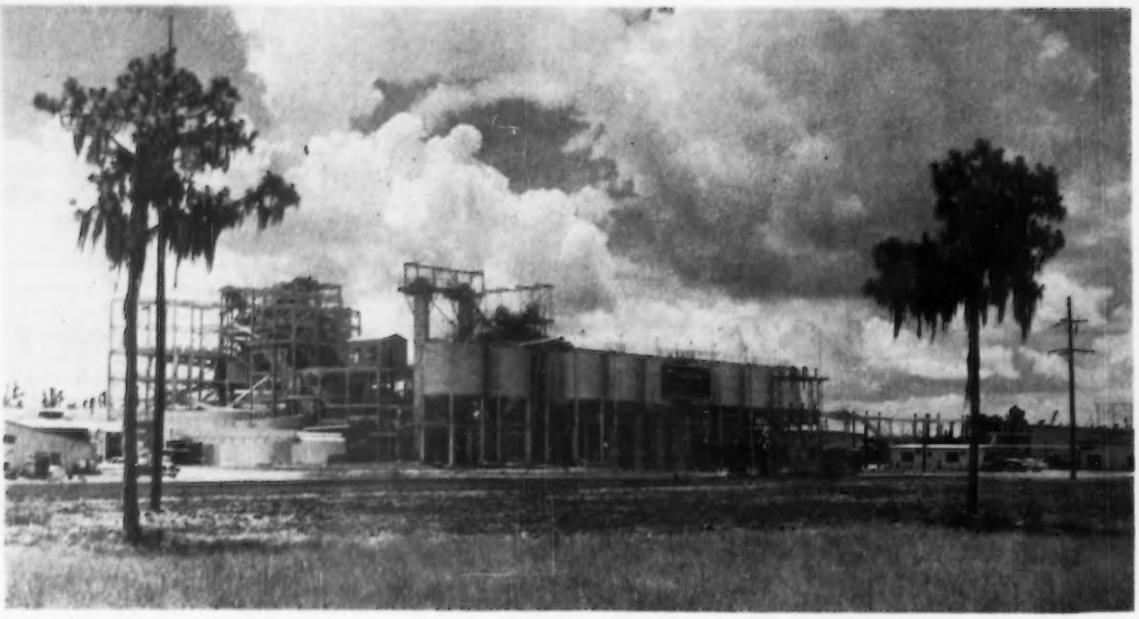
Because of the low position of the smelting zone and the low percentage of coke required on the inverted-bosh furnace, the total height of the furnace need not be great for the descending charge column to recover most of the heat in the ascending gases and to give low temperature exit gases.

How Scrap Is Collected

Scrap is first accumulated at the corner junk shop, then purchased by a large dealer who separates the various metals. The large scrap dealer usually services industrial plants by buying their scrap. In many cases, the dealer ships the scrap direct to the mill that made the metal.

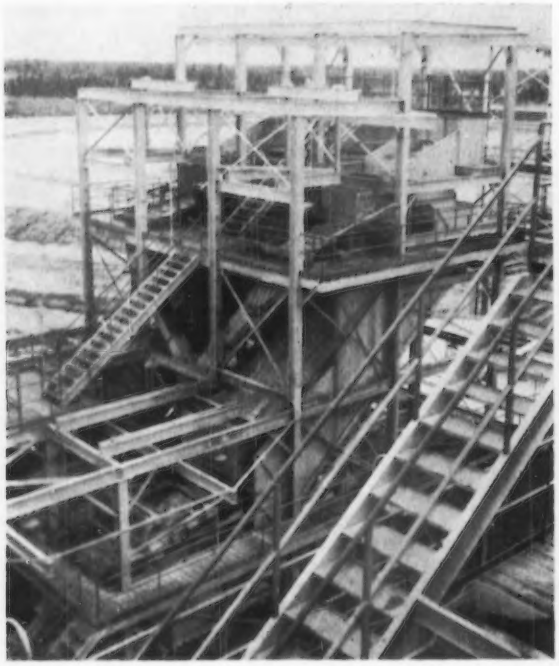
The dealer also may sell a carload of bronze valves, brass spigots, etc., to the brass or bronze ingot maker who refines this scrap into alloy.

Some scrap is so contaminated that there is value only for the recovery of the base metal rather than alloy. Copper smelters, like Franklin Smelting & Refining Co. consume any copper-bearing material such as irony brass, sweepings, ashes, skimmings, residues, radiators, wire, grindings, powders, cuttings, chips and clad materials. Actually, the poorest and lowest grades of scrap make up the charge at Franklin Smelting. *E&MJ* would like to thank Milton I. Schwab and Franklin Smelting & Refining Co. for their many courtesies extended during our recent visit.

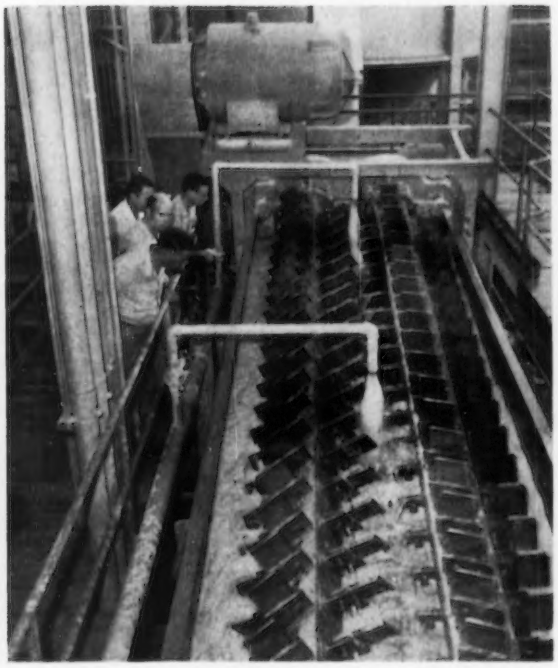


LATE IN JUNE, phosphate industry representatives were invited to inspect Cyanamid's Orange Park mine, washer and flotation plant. The new operation started May 6 and replaces the Saddle Creek mine, depleted in January 1957. F. A. Vogler is mine superintendent at the new plant located four miles northeast of Lakeland, Fla.

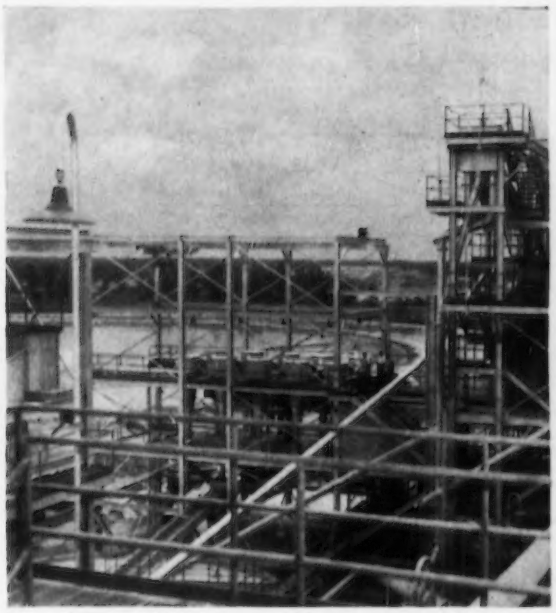
American Cyanamid Shakes Down



DUPLEX WASHER separates a coarse pebble product from the mixture of sand, clay and phosphate. E. M. Haynsworth, mines manager, and W. J. Pace, chief engineer, directed design and construction of the project.



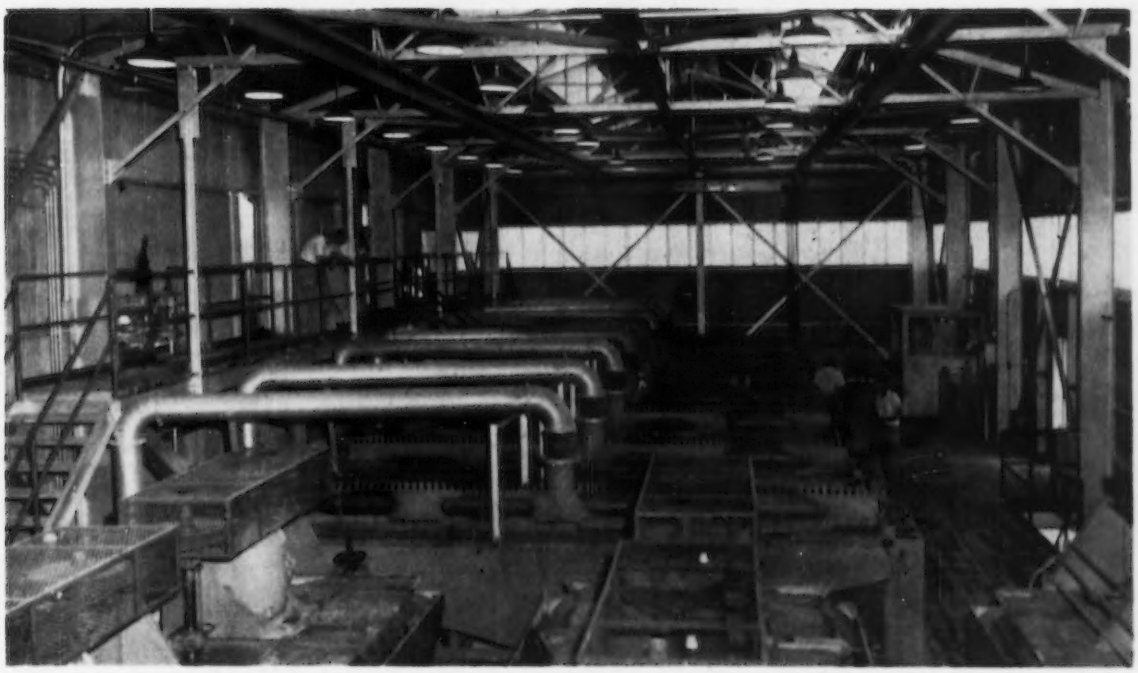
LOG WASHERS scrub the matrix. Grady Barnett, plant superintendent, is pleased with a mechanical jack that simplifies slope adjustments on the logs, being examined here by phosphate industry representatives.



CYCLONES, 48-in. dia, reject most of the slimes from the underflow. Flotation feed is further rinsed and sized in a classifier and sizer section shown to the right.

CLASSIFIERS feed reagent mixing equipment for the three flotation plant sections. Wet phosphate rock is shipped to Cyanamid's plant headquarters at Brewster.

A New Pebble Phosphate Washer

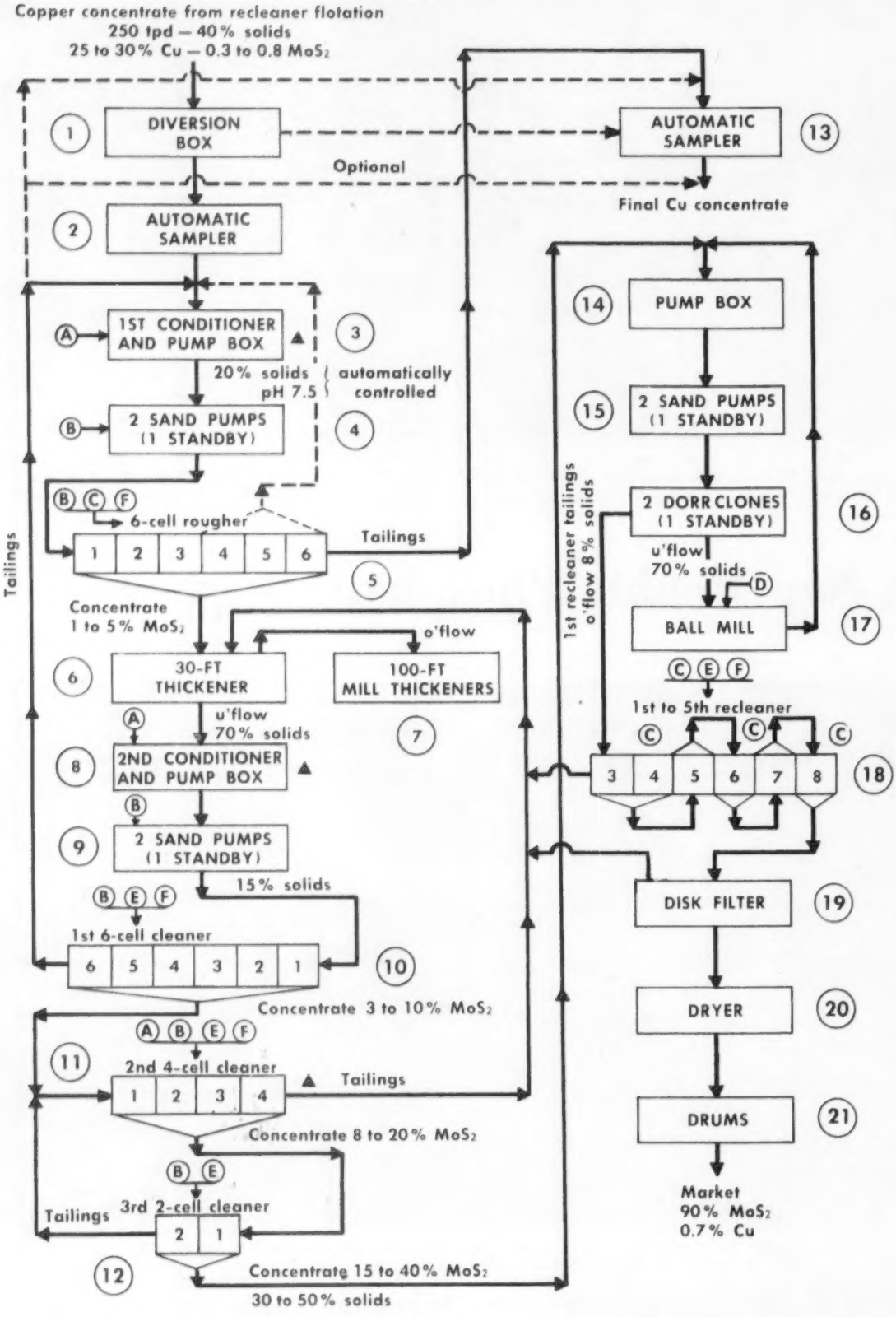


AIR CELLS, designed at Brewster, treat coarse and fine fractions separately to produce a rougher flotation concentrate that is de-oiled with sulphuric acid, washed and treated for silica removal in a second amine flotation stage.

Flotation plant was designed for 500-tph feed rate. *E&MJ* would like to thank Arthur Crago, manager of Florida phosphate operations, and the American Cyanamid Co., for permission to visit Orange Park in June.

SILVER BELL MOLYBDENITE PLANT

Silver Bell, Ariz.



How AS&R Raised Molybdenite Recovery on Copper Concentrate

OVER-ALL METAL RECOVERY at American Smelting & Refining Co.'s Silver Bell unit has been increased by installation of a Morenci-process molybdenite recovery plant at the 7,500-tpd concentrator, located at Silver Bell, Ariz.

Plant treats low-grade sulphide copper ore containing a small amount of molybdenum mined from the nearby Oxide and El Tiro pits, producing a final recleaner flotation concentrate assaying from 25 to 30% copper and 0.3 to 0.8% molybdenum. Extensive test work carried out at Silver Bell prior to installation of the molybdenite recovery plant indicated that about 80% of the metal present in the concentrate can be recovered economically.

The process applied at the plant for recovery of a marketable product was perfected some years ago at the Morenci concentrator of Phelps Dodge Corp., hence the name Morenci process. It differs from other known procedures in several ways. For instance, the method used at a number of western concentrators involves subjections of the xanthate-activated concentrate (xanthates are used as copper collecting agents) in pulp form to prolonged heating by steam, followed by flotation for recovery of molybdenite by using mineral oil collecting agents. Copper and iron sulphides are depressed.

Another known process requires depressing the molybdenite in the copper concentrate in a flotation step by use of soluble starch, with the tailing—a low-grade molybdenite concentrate—being successively thickened, filtered, roasted at low temperature, repulped with water, and upgraded to a marketable product by several flotation steps. A thiophosphate collecting agent is used for floating the copper minerals.

The Morenci Process

In the Morenci process, on the other hand, a high-grade molybdenite concentrate is produced by flotation in several steps. No intermediate roasting or heating of pulp by steam are required. Sodium ferrocyanide and sodium cyanide are employed as depressants and sulphuric acid as a pH modifier. Operating procedures and equipment used in the plant are explained in detail in the accompanying flowsheet. It is a one-man operation thanks to wide use of automatic control equipment.

Some of the significant features of the flotation operations practiced in the plant include dewatering of the concentrate produced by the rougher machine followed by dilution with fresh water and regulation of pulp density, both to partially eliminate frothing and collecting agents and permit control of froth formation; control of pH to provide proper environment for effective functioning of the sodium ferrocyanide; addition of the ferrocyanide at different steps to maintain optimum depressing effects on copper and iron sulphides with minimum consumption of the reagent; and a final multi-step recleaning operation in which sodium cyanide is used as the chief depressant. The product obtained from the recleaner circuit assays 90% MoS_2 and 0.7% Cu.

Capacity of the molybdenite recovery plant is 250 tons of copper concentrates a day. Installed on the lowest bay of the concentrator floor it is a part of the general mill flowsheet. The copper concentrates to be treated are received at the plant at 40% solids. They are first sent to a diversion box at the head of the plant with an arrangement to bypass the plant if this is desired. From here the concentrates go to a conditioner where water is added to dilute the pulp to 20% solids and sulphuric acid for pH control. A pH of 7.5 is maintained at this point. Both pulp density and pH are controlled and reported automatically. After addition of sodium ferrocyanide at the sand pump, the conditioned pulp is pumped to the rougher circuit consisting of a 6-cell flotation machine. Reagents include sodium ferrocyanide, sodium cyanide, and oronite and diesel oil.

Concentrates taken off the rougher unit assay from 1 to 5% MoS_2. Tailings join the final copper concentrates shipped to the El Paso smelter. The rougher concentrates go to a 30-ft thickener where they are mixed with the tailing from the second cleaner machine. Overflow is passed to the 100-ft concentrator thickeners, and the underflow at 70% solids goes to a second conditioner where sulphuric acid again is added and water to dilute the pulp to 15% solids.

Conditioned pulp is pumped to the first cleaner unit, a 6-cell machine, with sodium ferrocyanide, frother, and oronite and diesel oil used in the circuit. As in the rougher circuit, sodium ferrocyanide is added at the sand pump. Two additional cleaning steps involving treatment in a 4-cell machine and a 2-cell machine upgrade the 3 to 10% MoS_2 concentrate from the first cleaner to 8 to 20% MoS_2 in the second step and to 15 to 40% MoS_2 in the third step. Tailings from the first cleaner are returned to the first conditioner ahead of the rougher circuit, those of the second cleaner to the 30-ft thickener, and those from the third cleaner to the head of the second cleaner machine. Sulphuric acid, sodium ferrocyanide, frother, and oronite and diesel oil are the reagents used in the second cleaner operation, and sodium ferrocyanide in the third cleaner circuit.

The concentrate from the third cleaner operations is sent at from 30 to 50% solids to a pump box ahead of the regrind circuit consisting of

LEGEND

1. Diversion box
2. Automatic sampler
3. Conditioner and pump box
4. Two sand pumps (1 standby)
5. No. 24 Denver 6-cell rougher
6. 30-ft thickener
7. 100-ft thickeners located in the main copper concentrator section collect overflow from 30-ft thickener (6). Underflow from 100-ft thickeners is feed for the regular copper circuit cleaner flotation section. There are no tailings going to the dump from the moly plant.
8. Conditioner and pump box
9. Two sand pumps (1 standby)
10. No. 18 Denver 6-cell first cleaner
11. No. 12 Denver 4-cell second cleaner
12. No. 12 Denver 2-cell third cleaner
13. Automatic sampler
14. Pump box
15. Two sand pumps (1 standby)
16. Two 3-in. DorrClones (1 standby)
17. Marcy No. 34 ball mill
18. No. 12 Denver 6-cell recleaner
19. Disk filter
20. Dryer
21. Steel shipping drums

REAGENT SYMBOLS

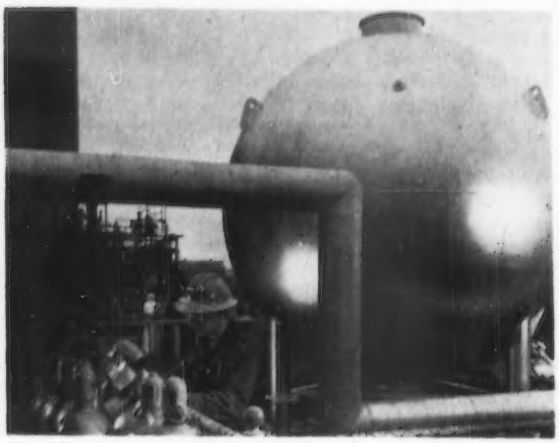
B Na_2SO_4
B $Na_4Fe(CN)_6$
C NaCN
D Na_2SiO_3
E Frother
F Oronite and diesel oil

Arrow indicates points at which pH is controlled automatically

a 3-in cyclone operating in closed circuit with a ball mill. Cyclone overflow at 8% solids is the feed for the final recleaner circuit and the 70% solids underflow the ball mill feed.

Final recleaning of the cyclone overflow is done in a 6-cell machine in stages. The feed is first treated in the two cells heading the circuit, with concentrates passing to the next cell, concentrates from this cell advance to the next cell, and so on to the sixth cell, from which the marketable concentrate is taken. Tailings from the first two recleaner cells go to the 30-ft thickener mentioned previously. Reagents used in the recleaner operation are sodium cyanide, frother, and oronite and diesel oil. The sodium cyanide is used in the first, third, and fifth steps. Finished concentrates are dewatered in a disk filter, with the overflow joining the tailings from the first two recleaner cells sent to the 30-ft thickener. The filter cake is dried in a small dryer and subsequently loaded into steel drums for shipment.

Reagent consumption per ton of copper concentrate treated (average figures) is as follows: H_2SO_4, 4.860 lb; $Na_4Fe(CN)_6$, 2.380 lb; NaCN, 2.480 lb; Na_2SiO_3, 0.048 lb; frother, 0.070 lb; and oronite and diesel oil, 0.520 lb.



DIBORANE is being shipped to Air Force from Niagara Falls.

Boron Fuels Go Semi-Commercial

BORON AND ITS RELATED high energy fuels may well become a $1-billion business in next ten years, according to Olin Mathieson Chemical Corp. officials at their Niagara Falls, N. Y. semi-commercial boron fuel plant. Spokesmen stated that Olin's research developments in the past two years have brought the price of high energy fuels of boron derivation down rapidly, and that the mass production price will be moderate (talk was in the order of $1 a gallon, although guesses ranged from $10 to $100) and low enough to permit wide usage in the aircraft propulsion field. Current jet engine fuels cost about 9c a gal.

Olin's semi-works cost $5.5-million and is a fully integrated plant. A second plant, three times as large as the semi-works, is now under construction. It will cost only $4.5-million, since Metal Hydrides Inc. is building a $5.2-million plant and will supply the sodium borohydride needed for this interim plant, which will go onstream late this year.

A full-scale fuel plant, costing $36-million and 12.5 times the size of the present semi-works, is on the drawing boards and will be running by late 1958.

Present semi-works is making HEF-2, high energy fuel No. 2, an alkylated pentaborane which is stable and easy to handle, and which is expected to increase air breathing aircraft flying ranges by 40%. Full-scale plant will produce HEF-3, and alkylated decaborane, or even HEF-4, whose composition has not been disclosed.

Boron will be converted to fuel as follows: lithium (or sodium or boron) hydride and boron trichloride will be reacted together in ether, reducing the trichloride to the diborane. Then the diborane will be pyrolyzed to pentaborane or the decaborane.

Boron is obtained from borax, 95% of which comes from U. S. deposits owned by U. S. Borax & Chemical Corp. (70% of U. S. production), Stauffer Chemical Co. (10%), and American Potash & Chemical Corp. (20% of domestic output). High energy fuels reduce jet engine flame-outs, increase flying ranges by up to 40%, increase top flying speeds by cutting fuel load demands, cut fuel costs and offer a safer fuel than present day types.

One gram of coal (carbon) yields 8,000 calories upon ignition, but one gram of diborane fuel releases 16,000 cal. In heat releasing ability, elemental hydrogen is the best possible fuel, but it is difficult to contain and use safely. Compounds of beryllium, boron, lithium and carbon rank next to hydrogen in that order.

Many other companies are involved in high energy research—American Potash & Chemical Corp. (a 1 lb per day pilot plant producing decaborane), U. S. Borax & Chemical Corp., Stauffer Chemical Co. (boron trichloride producer), Hercules Powder Co., Wyandotte Chemical Corp., Thiokol Chemical Corp., Metal Hydrides Inc., and Mine Safety Appliances Co. and Gulf Oil Corp., through Gulf's Callery Chemical Co. Callery has a small plant at Lawrence, Kan. and is building a $38-million facility at Muskogee, Okla.

How much fuel will these pilot and full-scale plants turn out? Nobody will say, but the total output will probably be a drop in the bucket compared to what the Army, Navy and civilian aircraft industry could use at the right price and at the right time.

Selecting Valves

(*Continued from p 97*)

by any other single mistake. Do open the valve part way out to flush away foreign matter on the seat.

10. Don't use gate valves or cocks for throttling purposes. Serious "wire drawing" may result from concentrating the flow at the part of the seat further from the wedge or gate support. Do use globe and angle valves for throttling service as the flow will then be all around the seat and be balanced around the disk support.

In the use and operation of valves, as with any other equipment, safety is an ever important factor. The following valve safety suggestions are offered by the National Safety Council:

1. Install valves which are equal to the job in design, materials and construction.

2. Operate valves slowly or use by-pass. Valves should be locked if there is any possibility of unauthorized manipulation. Be sure to lock valves leading to boilers in which men are at work and valves on lines where repairs are being made. Place warning signs near all valves.

3. Don't remove valve wheels from valves particularly those at danger points calling for emergency operation.

4. Don't turn a valve stem with a wrench. This may make it impossible to operate the valve.

5. Inspect frequently valves subjected to unusual strain from excessive pressures and temperatures, and valves weakened by erosive gases or liquids.

CONVEYOR BELTS

9 long years—over 12 million long tons

AND STILL GOING STRONG!

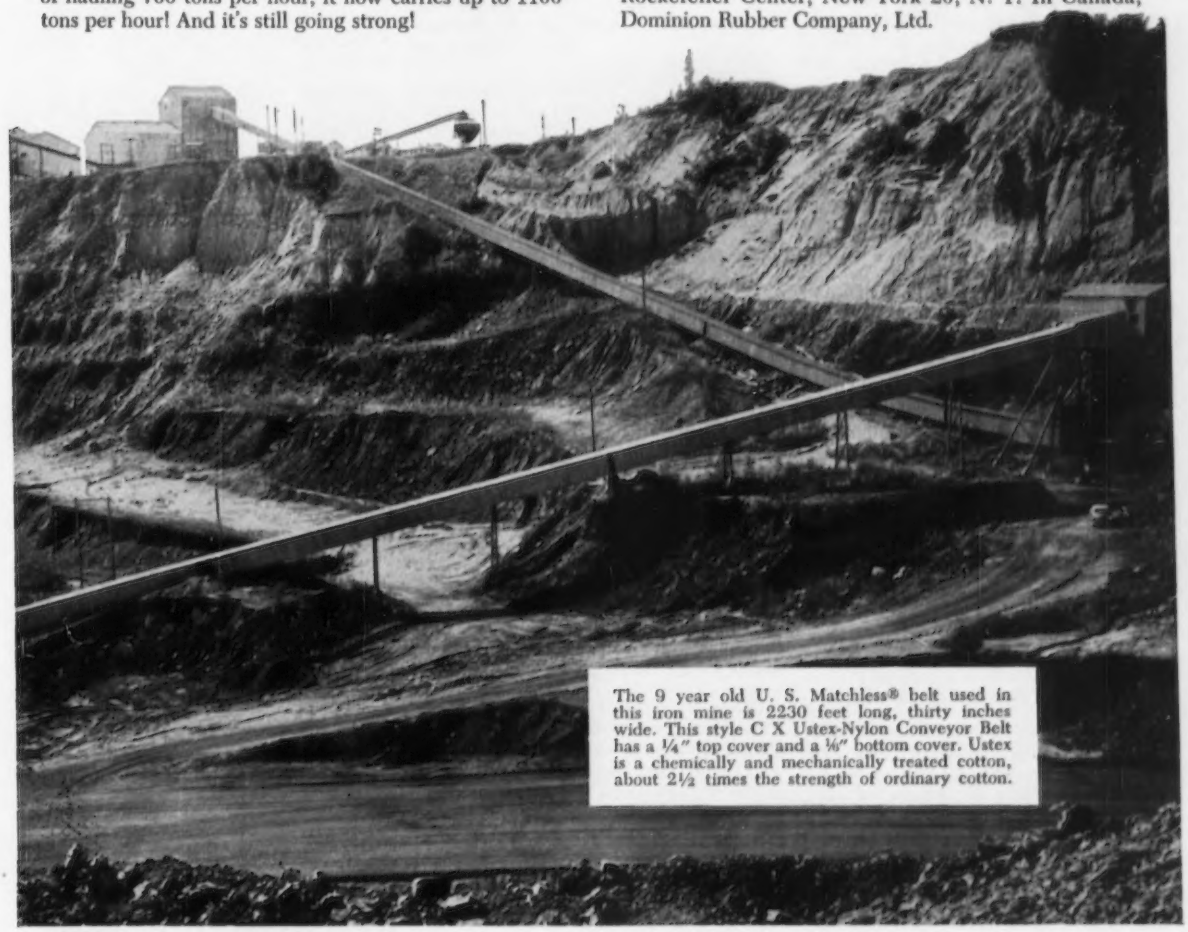
Back in March, 1948, "U. S." installed the first Ustex-Nylon Conveyor Belt ever used in an iron mine. That was 9 years—and over 12,000,000 long tons—ago.

Today, this belt not only is still performing up to expectation, but is actually hauling *many more long tons per hour than when it was new.*

Originally designed in two sections to carry 700 long tons, the belt was transferred, three years after its original installation, to another mine of the operating company—a mine that needed stepped-up production. There, this gigantic belt was spliced into a single length and instead of hauling 700 tons per hour, it now carries up to 1100 tons per hour! And it's still going strong!

This patented Ustex-Nylon Conveyor Belt seems almost indestructible, even under the severe battering of iron ore. Made of Ustex for stamina and Nylon for flexibility, it has saved its owners untold dollars in maintenance and replacement costs alone.

For record breaking performance in your mine, ask about U. S. Rubber's Three-Way Engineering, in which our engineers work with conveyor systems engineers and your own engineers. This service, plus a complete line of belts, is available at any of the 28 "U. S." District Offices, or write U. S. Rubber, Mechanical Goods Division, Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Company, Ltd.



The 9 year old U. S. Matchless® belt used in this iron mine is 2230 feet long, thirty inches wide. This style C X Ustex-Nylon Conveyor Belt has a ¼" top cover and a ⅛" bottom cover. Ustex is a chemically and mechanically treated cotton, about 2½ times the strength of ordinary cotton.

Mechanical Goods Division

United States Rubber

PERSONALS

Dreyer

Lewin

Felix S. Dreyer and **Richard H. Lewin,** president and executive vice president, respectively of Lewin-Mathes Co. Div. of Cerro de Pasco Corp., have been elected members of the board of directors of the corporation. The properties, assets and business of Lewin-Mathes, producer at its integrated plant in Monsanto, Ill., of copper and brass tube, pipe and rod, were acquired by Cerro de Pasco in exchange for its common stock in a recent transaction.

George Cobb has been placed in charge of the uranium division of Kerr-McGee Oil Industries, Inc. **V. L. Mattson** will direct uranium research, with laboratory and offices in Denver, Colo., **Dick Zitting** will head the uranium exploration division in Oklahoma City, and **Marion Bolton** has been named manager of Kerr-McGee's Shiprock, N. M., mining and milling operations.

M. L. Urquhart, manager of the McIntyre mine, has been appointed general manager of McIntyre Porcupine Mines, Ltd. Mr. Urquhart joined the McIntyre organization in 1922. He is also president of the Ontario Mining Association.

Newmont Exploration Ltd., subsidiary of Newmont Mining Corp., has established a geophysical and metallurgical research laboratory near Danbury, Conn. Geophysical section is under the direction of **Dr. A. A. Brant** and the metallurgical section under the direction of **L. J. Bechaud Jr.**

Paul F. Karrow has been appointed to the geological staff of the Ontario Department of Mines, succeeding **A. K. Watt** who has been transferred to the newly formed Water Resources Commission. Mr. Karrow is a geology graduate from the University of Illinois.

Nathan D. Adams has been appointed manager of the McIntyre mine at Schumacher, Ontario, succeeding **M. L. Urquhart,** now general manager, of McIntyre Porcupine Mines, Ltd. Mr. Adams joined McIntyre in 1930 following his graduation from the University of Toronto. **James M. Hamilton** has been named assistant manager of the company's McIntyre mine. He had been mine superintendent since 1951.

John S. McNabb Jr. has been appointed head of the engineering department of Twin Star Industries, Inc., Austin, Tex. A graduate of the U. S. Military Academy and Michigan College of Mines, has been active in the mining and engineering field for over ten years and was most recently on the mining engineering staff of International Minerals & Chemical Corp.

Charles K. MacArthur, manager of the pilot plant at AEC's Grand Junction compound for two years, has been promoted to technical director of the Raw Materials Development Laboratory in Winchester, Mass., succeeding **John S. Breitensten. Robert G. Beverly,** for three years alkaline and acid plant superintendent at Grand Junction, will become plant manager, succeeding Mr. MacArthur.

Lester R. Child, Grants Pass, has been appointed to the Oregon Board of Geology and Mineral Industries, succeeding **Neil R. Allen,** who resigned. **Norman V. Peterson** has joined the staff succeeding **Max Schafer** who resigned. He will be stationed at Grants Pass, Ore.

George W. Wunder has been appointed manager of the newly formed Nuclear Metals Division of National Lead Co., directing research and development work on commercial and industrial applications of atomic energy. In his new position, Mr. Wunder becomes a vice president and general manager of National Lead Co. of Ohio, and National Lead Co., Inc., subsidiaries of National Lead Co. A graduate of the Colorado School of Mines, he joined National Lead in 1948 as assistant plant manager of its titanium mine and mill at Tahawus.

Wunder

Thomas H. Wickenden, retired vice president of the International Nickel Co., Inc., and manager of its development and research division, has been awarded the honorary degree of doctor of science from Denison University.

David Bennett, who had been with the Harza Engineering Consultants, is now associated with North Range Mining Co., and is located in Negaunee.

Oliver G. Seymour and **Paul Zimmer,** Iron River, geologists with the M. A. Hanna Co., have been given new appointments. Mr. Seymour will be in charge of exploration work in the Michigan district and will spend some time on property examinations and exploration in Latin America. Mr. Zimmer will be in charge of geological work at the Hanna Co. operating mines.

Modesto L. Leonardi has been named manager of plant production at American Potash & Chemical Corp.'s main plant at Trona, Calif. Mr. Leonardi has been with the company since 1939, after completing his education at the University of Nevada. **A. J. Anderson,** formerly manager of plant production, has been appointed advisory engineer for the Trona facility.

Dr. Bahngrell W. Brown has been named acting head of the Department of Geology at Montana School of Mines, Butte. Dr. Brown joined the faculty of Montana School of Mines in 1955.

Charles L. Schmidt has been appointed technical director of the Titanium Division of National Lead Co. He had been assistant technical director of the division since 1953. **James H. Noyes** has been appointed plant manager of the National Lead Co.-operated AEC installation in Fernald, Ohio. He joined National Lead as assistant manager of that plant in 1953. **Roy Dahlstrom** has been appointed director of research for the company, supervising and coordinating the activities of all the laboratories of National Lead Co.

Richard Moe, formerly general manager at White Pine Copper Corp., Michigan, is now general manager at Kermac Nuclear Fuels Corp., Grants, N. M.

Richard B. Davern has been named treasurer of United States Steel's Oliver Iron Mining Division. Formerly assistant treasurer, Mr. Davern succeeds **Raymond L. Lason,** who retired recently after 45 years of service with Oliver.

Dr. Istvan Karsay has joined the staff of the International Nickel Co.'s research laboratory at Bayonne, N. J., as a research metallurgist in the ferrous castings section. A Hungarian refugee who was sponsored by the National Academy of Sciences, he arrived in the United States recently. He had been a design engineer and research metallurgist at the Iron Research Institute, Budapest, from 1951 to 1956.

Raymond C. Dosta, former assistant treasurer of United States Borax & Chemical Corp., has been promoted to treasurer, succeeding **R. F. Steel,** who has been appointed to the newly-created post of assistant general manager. **W. A. Ackerman** has been elected secretary of the corporation. He was formerly assistant secretary.

Dr. Earl F. Cook has been named dean of the University of Idaho, College of Mines, and director of the Idaho Bureau of Mines and Geology. He had been serving in an acting capacity in both positions for the past year, since the resignation of **Dean J. D. Forrester.** Prior to joining the Idaho faculty in 1951, he taught at the University of Washington as well as at Stanford University, and had been a photogeologist for Geophoto Services, of Denver, Colo.

Cook

for longer valve life

in a variety of corrosive services

JENKINS NI-RESIST GATE VALVES

Where you encounter acids, salt and alkaline solutions, sea water, brine or other corrosive fluids, vapors or gases, you'll want Jenkins Ni-Resist Type 2 Cast Iron Gate Valves with type 316 stainless steel trim. They have a remarkable ability to withstand destructive corrosion and erosion.

In paper mill service, food processing, petroleum refining, chemical plants and other process industries, Jenkins combination of Ni-Resist type 2 cast iron and type 316 stainless steel, plus Jenkins extra *value* construction throughout greatly extends valve life.

Designed especially for corrosive services, the Jenkins Ni-Resist line of gate valves also has superior metal-to-metal wearing qualities. Copper-free, they will not discolor or contaminate products being carried in the line. Let the famous Jenkins Diamond be your guide when choosing Ni-Resist valves . . . it means longer, trouble-free service.

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LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros.

Sold Through Leading Industrial Distributors Everywhere

PERSONALS *(Continued)*

Gesler

O'Heir

David W. Gesler has joined the Perlite Institute as its new advertising and promotion director. **Richard J. O'Heir** has been promoted from technical director to secretary-treasurer of the institute. Mr. O'Heir's new position follows five years experience supervising the institute's research and development projects. He will now also be responsible for policy and administrative decisions. Mr. Gesler will develop an extensive advertising and promotional campaign to broaden the various markets for perlite.

Arthur W. Fahrenwald, dean emeritus of the University of Idaho College of Mines, was awarded a special citation, at a recent Columbia section AIME meeting in Kellogg, for being the outstanding engineer in the mineral industries in the Northwest. The citation was made by **A. Y. Bethune,** manager of metallurgy for the Bunker Hill Co. in recognition of Dr. Fahrenwald's 35-year career as one of the nation's foremost mining engineers and college administrators.

Jerry E. Tong has been named resident manager of Duval Sulphur & Potash Co.'s Potash Division, succeeding **George Atwood,** who has been transferred to the newly-established Copper Division as resident manager of the Esperanza Property near Tucson, Ariz. Mr. Tong joined Duval as mine superintendent in 1950 and was promoted to assistant resident manager in 1954. It was also announced that four top supervisory employees are being transferred from Carlsbad to Tucson, where Duval is building a copper plant: **H. A. London,** superintendent of maintenance and construction in the Potash Division, was named to the same position in the Copper Division; **I. B. Phillips,** mill superintendent in the Potash Division, will be mill superintendent in the Copper Division; **S. C. Polasek,** chief accountant was named to the same position in the Copper Division; **B. G. Messer,** former chief engineer of the Potash Division, but who has been in charge of copper exploration work for the company near Tucson, will be assistant resident manager of the Copper Division.

J. W. Borskey has been appointed assistant resident manager of the Potash Division of Duval Sulphur & Potash Co. He had been chief chemist since 1950. Other promotions announced include: **D. J. Bourne,** refinery superintendent; **A. T. Jones,** superintendent of maintenance and construction; **M. H. Harrison,** refinery general foreman; **Theodore H. Pate Jr.,** chief accountant; **B. F. McGuire,** chief engineer; **W. M. Bourn,** refinery assistant general foreman; **W. H. Long,** maintenance and construction general foreman; and **C. R. Tagert,** assistant surface mechanical foreman.

Marion Bolton has been named manager of Kerr-McGee Oil Industries' mining and milling operations at Shiprock, N. M. Other changes in the firm's uranium management staff include promotion of **George Cobb** to director of the uranium division; **V. L. Mattson** will have charge of research activities with laboratories in Denver; **Dick Zitting** will direct uranium exploration from the company's Oklahoma City headquarters.

Adolph V. Mitterer has been promoted from plant geologist to mine engineer, International Minerals & Chemical Corp., succeeding **Robert H. Lane** who is being transferred to Canada. A graduate of Colorado School of Mines, Mr. Mitterer joined IMCC as junior mine engineer in 1954.

Federated Metals Division of American Smelting & Refining Co., has established a new Central Aluminum Department. **G. M. Baumann,** former assistant to the vice president in charge of the Federated Metals Division, will head the new department with the title of general manager, with headquarters at Alton, Ill., when the plant goes into production in mid-1958. A graduate of the Columbia University School of Mines, he joined the company permanently in 1938.

Baumann

Department of the Interior has announced the retirement of **Carl G. Paulsen,** chief hydraulic engineer for the Geological Survey, and the advancement of **Dr. Luna B. Leopold** to succeed him. Also announced was the designation of **Raymond L. Nace** as assistant chief of the Survey's water resources division.

Board of Directors of American Zinc Lead and Smelting Co. has recently elected **Miss Leona S. Jones** assistant secretary of the parent and subsidiary companies.

Harry J. Wolf, mining and consulting engineer of New York, investigated mineral deposits in North Carolina, and examined mines in British Columbia, during May and June.

William F. Darmitzel has been appointed executive director of the New Mexico Mining Association.

Clint P. Haight Jr., an active prospector in eastern Oregon, has been appointed to the governing board of the Oregon Department of Geology and Mineral Industries by Governor Robert D. Holmes, succeeding **Austin Dunn,** recently resigned.

E. C. Roper has been named president of the Howe Sound Co., succeeding **Harold H. Sharp.** Mr. Roper was manager of Britannia Mining & Smelting, operated by Howe Sound, until December 1955, when he went to the company's head office in New York as executive vice president.

Howard W. Balsley of Moab, Utah, has been elected president of the Uranium Ore Producers Association. Also elected was **William Orr,** as executive vice president of the association.

R. Lee Aston has resigned as mine geologist of the Tennessee Copper Co. to become plant engineer of the Signal Mountain Division of General Portland Cement Co.'s operation at Chattanooga, Tenn. Mr. Aston, a graduate of Missouri School of Mines, was with TCC for 7 years.

Five men have been elected to higher positions at Mexico Refractories Co.: **John B. Arthur**—chairman of the board; **W. Basil Leach**—president; **Charles A. Smith**—executive vice president; **Carl H. Bachmann**—vice president in charge of production; and **Roger A. Hitchins**—vice president in charge of National division.

George A. Komadina has joined the staff of Pima Mining Co., Tucson, Ariz., as mill superintendent. He was formerly chief metallurgist of the Mining & Smelting Div., Eagle-Picher Co., Miami, Okla.

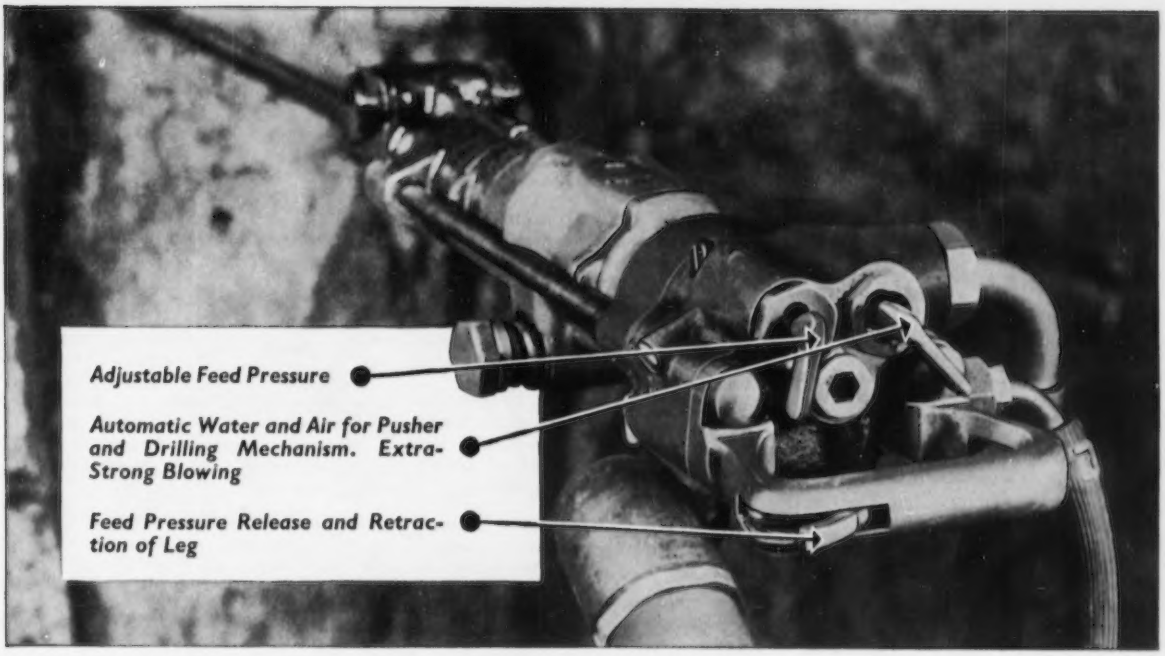
Richard F. Steel has been appointed assistant general manager of the U. S. Borax & Chemical Corp., with headquarters in Los Angeles. He was secretary and treasurer of the corporation.

Robert Boutang, Hibbing, Minn., has been promoted to pit foreman at the Morton mine, M. A. Hanna Co., and **Joe Nosan** to pit conveyor foreman.

Hjalmar Tacklund, mining captain at the Armour No. 1 mine of Inland Steel Co. on the Cuyuna Range, has retired. He had worked on the Range for 46 years.

P. N. Miles has been named manager of the mining sales division of Christensen Diamond Products Co., succeeding **Alan Conner,** who is currently directing operations at Castle Concrete Co., a subsidiary of Christensen. Mr. Miles has been directly concerned with the sale of diamond bits and associated equipment for the mining industry since he joined the company in 1951. He will now direct the company's mining sales activities in the U. S., Mexico and South America.

Miles


Adjustable Feed Pressure
Automatic Water and Air for Pusher and Drilling Mechanism. Extra-Strong Blowing
Feed Pressure Release and Retraction of Leg

THE ATLAS COPCO LION—
A REVOLUTIONARY NEW ROCK DRILL

All controls under one hand

The Atlas Copco Lion is the first drill to have all the valves which operate the drill under the control of one hand. *Full and easy control without having to move the hand from the backhead!* All the controls have been designed so that they are well protected. While using them the operator's hand is never near the wall or roof of the drift. The Lion is the first pusher leg drill with controls placed for drifting.

Retractable leg saves time

When the leg has to be moved the feed pressure is easily released by squeezing the hand grip. By further pressure on the grip the leg retracts automatically. When the leg is in the new position suitable for continuous drilling, retraction stops and the feed pressure comes back by loosening the grip of the hand. *All this can be done while the drill is still running.*

This new idea of a retractable leg enables quicker repositioning of the leg and reduces the number of steel changes, thereby increasing footage per manshift. When drilling high holes it is now far easier to alter the position of the leg more frequently in order to maintain an optimal feed angle and feed pressure.

Packed with power for deep holes

The Lion has a drilling rate at least 30% higher than other rock drills of the same weight. Furthermore, it can maintain its high speed *even when drilling deep holes.* This means quickly drilled deep hole rounds and a faster advance. The Lion also reduces *to a minimum* the gauge wear of the bits in abrasive rock. And owing to the ease with which the feed pressure is released and brought back into action, the Lion is a *handier* drill to work with in fissured rock.

Sandvik Coromant—the steel for the Lion

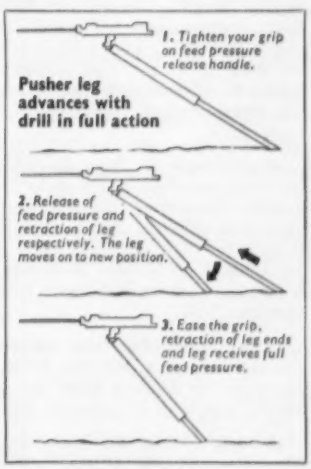
All Atlas Copco drills—and this goes for the Lion too—have been developed from the earliest stages with Sandvik Coromant tungsten-carbide-tipped integral steels and detachable bits. This combination pioneered tungsten carbide drilling in the early forties. No drill or steel developed separately could ever give such equivalently high performances as this drilling combination. Today it is the most widely used in the world, responsible for drilling more than 1,000 million feet annually.

For further information on the Atlas Copco Lion rock drill, and details of sales and service, please contact:

U.S.—Atlas Copco Pacific, Inc., 930 Brittan Avenue, San Carlos, California, or Atlas Copco Eastern Inc., P.O. Box 2568, Paterson 25, N.J.

CANADA—Atlas Copco Canada Limited, Montreal Airport, P.Q.

MEXICO—Atlas Copco Mexicana S.A., Apartado Postal 56, Torreon, Coahuila.


1. Tighten your grip on feed pressure release handle.
Pusher leg advances with drill in full action
2. Release of feed pressure and retraction of leg respectively. The leg moves on to new position.
3. Ease the grip, retraction of leg ends and leg receives full feed pressure.

Atlas Copco

D5574A

Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment

PERSONALS *(Continued)*

Ernest L. Ohle has been appointed chief geologist in charge of the geology department of Copper Range Co. and White Pine Copper Co. A graduate of Washington University with a PhD in mining geology from Harvard University, he was employed for 7 years as geologist and assistant mine superintendent by American Zinc, Lead & Smelting Co. until 1948 when he became geologist for St. Joseph Lead Co. Mr. Ohle spent last summer on a geological assignment in Mozambique, Africa. He taught courses in mineral deposits at Washington University in 1953 and 1957.

Ohle

George E. Lerick, operating assistant at the Mahoning mine of Pickands Mather & Co., has been transferred to the Embarrass mine at Biwabik as general pit foreman, replacing **Tom Wills** who retired. **Joseph Veneziano,** shift boss at the Albany mine has been promoted to assistant mining captain. **John M. Walimaa** and **Victor P. Fumante** have been named shift bosses.

Dr. Y. William Isachsen, research geologist at AEC's Grand Junction Operations Office, has left to serve as technical advisor to the Turkish government in organizing a uranium exploration program. He will serve as a member of the Technical Services Organization with headquarters in Ankara, Turkey.

Edward P. Leach has been appointed general manager of the mining division, Bethlehem Steel Corp.

J. M. Shields, assistant superintendent at the West Hill mine of Pickands Mather & Co., has retired. **LeRoy T. Land,** superintendent at the Carmi-Carson Lake mine, has been transferred to West Hill as superintendent and **James E. Schelske** has been made assistant superintendent at the Carmi-Carson Lake mine.

Mord Lewis has been elected executive vice president and director of Anaconda Aluminum Co. He has been associated with the Anaconda organization since 1926, and has been a vice president of Anaconda Aluminum Co., a subsidiary of the Anaconda Co., since October 1956.

E. K. Smith has been named purchasing agent for Reserve Mining Co. He came to Reserve from the Armco Steel Corp.

Hendrik F. van der Laan has been elected president of Vitro Rare Metals Co., a division of Vitro Corp. of America. Mr. van der Laan, who has 21 years of experience in the field of extractive metallurgy, was formerly vice president and general manager of the Tin Processing Corp.

Harold Boback has been named mine geologist at the Hill-Annex mine of Jones & Laughlin Steel Corp., and **Blaine Peter** has been promoted to maintenance foreman at the Schley group at Gilbert.

Charles V. Harris has been promoted to assistant resident engineer for GSA in Nicaro and assistant resident administrator of Cuban Nickel Co., after completion of the $40-million expansion program of the U. S. Goverment-owned nickel plant.

Wyoming Mining Association re-elected **R. L. Moran** of Riverton as president for another year. **Glen Sorenson** of Kemmerer was re-elected vice-president and **H. D. Hand** of Casper was named secretary-treasurer.

Carlos Bardwell will retire as manager of Tooele smelter operations. A graduate of the University of Utah, Mr. Bardwell joined International Smelting & Refining Co. in 1913 and rose through various supervisory positions to the position of manager. He is the originator of the idea of using a constant air supply instead of maximum pressure in lead blast furnace operation, a change which almost doubled furnace capacity. **William J. McKenna,** a graduate of the Colorado School of Mines, has been promoted from general superintendent to manager of Tooele smelter operations. Mr. McKenna started his employment in 1916 during school vacation periods, and has held supervisory positions in many of the departments. He has been a leader in the development of treatment processes and reagent combinations for use in selective flotation of complex lead-zinc ores, and in the flotation of oxidized lead ores. **Emile W. Steinbach,** who was assistant general superintendent of operations, will move up to the position of general superintendent of Tooele smelter operations. A graduate of the Wisconsin State School of Mines, Mr. Steinbach has been employed by Internation since 1924. He has pioneered a method to use arsenic residue flue dust in the company's sintering plant.

Bardwell

McKenna

Steinbach

W. Basil Leach has been elected president of Mexico Refractories Co., Mexico, Mo. Previously vice president and director of sales, he has been associated with the company since its organization in 1929. Mr. Leach as president, succeeds the company's founder, **John B. Arthur,** who was named chairman of the board and chief executive officer. **C. A. Smith,** vice president and chief engineer, was named to the newly created position of executive vice president, retaining the responsibility of chief engineer.

Leach

Dr. J. Harlan Johnson, professor of geology and curator of the museum at Colorado School of Mines, has retired after 37 years of service on the faculty.

C. Jay Parkinson has been elected to the board of directors of the Anaconda Co. and the following Anaconda subsidiaries: Andes Copper Mining Co., Chile Exploration Co. and Chile Copper Co.

H. D. Hand of Globe Mining Co. has been appointed chairman of the Wyoming Mining Association's uranium committee. Other committee members are **Clyde Boyle,** Sodak Uranium & Mining Co.; **A. V. Quine,** Lucky Mc Uranium Corp.; **Hepburn T. Armstrong,** Wyoming Uranium Corp.; **Roy Coulson,** Vitro Minerals Corp. **Vern Hughes,** Shoni Uranium Corp.; **Wendell Fertig,** Western Nuclear Corp. and **G. W. Forrester,** Lisborn Uranium Corp.

OBITUARIES

W. C. Mendenhall, 86, former director of the U. S. Geological Survey, died June 3 at his Washington, D. C., home. Mr. Mendenhall retired in 1943 after serving on the USGS staff for 48 years. During his career, he served the profession in many important capacities. He was secretary of the 16th International Geological Congress, was president of the GSA and a vice president of the AAAS. The Society of Economic Geologists awarded him the Penrose Medal in 1944.

J. A. Theobald, 72, former mining engineer, publisher and editor in Colorado and former manager of the Price, Utah, Chamber of Commerce, died June 16 at Phoenix, Ariz. He was mining editor of the Denver Post from 1931 to 1938 and published *Mineral Age* in Denver for many years.

Ernest V. Neelands, 78, widely known mining engineer and executive in Canada, died May 25 in Toronto. He was a consultant for Ventures, Ltd., and has held varied engineering and supervisory positions with mines in Canada during the past.

Merle E. Hanson has operated other graders, and he says:

"THE NO. 12 HAS ALWAYS BEEN MY FAVORITE MACHINE"

This Caterpillar No. 12 Motor Grader maintains two miles of 40-foot haul road at an open pit copper mine near Butte, Montana. On the job 8 to 16 hours per day, 6 days a week, this hard-working machine has the enthusiastic approval of its operator, Merle E. Hanson.

"The No. 12 has always been my favorite machine," he says. "I've operated other makes of graders and have had a chance to compare. The No. 12 has good visibility and is easy to handle. It has always taken less adjustment and less repairs than any other machine."

Other Caterpillar-built machines are also on this Anaconda Company operation. Four D8 Tractors and two D6 Tractors are removing overburden and copper ore. The F & S Contracting Co. of Butte, and the Morrison-Knudsen Co. of Boise, Idaho, have a joint contract from The Anaconda Company to do a limited amount of work on this ore body.

Already known as the "standard of the industry," the No. 12 has pulled even further ahead of the field with its *exclusive* new Preco Automatic Blade Leveler, which makes it possible to control slopes within ⅛" in 10′ width. Other important features of the No. 12: powerful CAT* Diesel Engine; long radius, curved side shift rack that allows a full range of blade positions without changing links or adjusting the blade; tubeless tires — which reduce tire down time as much as 80%; and long-life oil clutch.

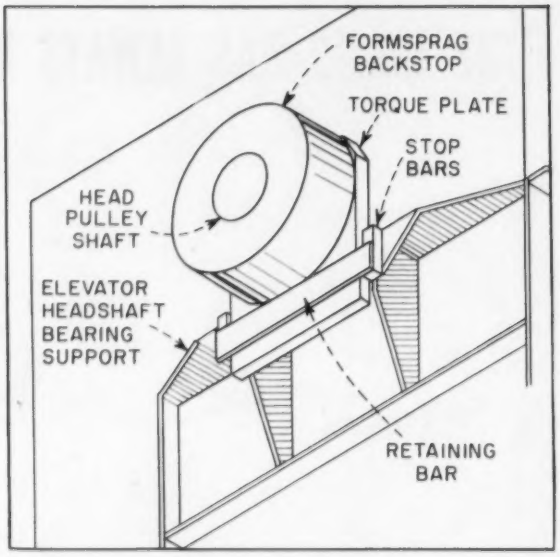
In addition to the No. 12, there are two other motor graders in the Caterpillar line: the No. 112 and the No. 212. Let your Caterpillar Dealer demonstrate the one best suited to *your* needs on *your* operation. You can count on him for expert, reliable service—and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK



FORMSPRAG clutch prevents reverse running of conveyors through use of sprag-like elements between inner and outer races, shown in cutaway miniature model. **Mounting** (right) is simple, with inner race keyed to headshaft and outer race fixed to torque plate. Stop bars, fixed to support, prevent torque plate from turning.

Proper Conveyor Holdback Is Good Insurance

FRANK G. STULLER

SPRAG-TYPE BACKSTOP CLUTCHES are recommended by Chain Belt Co. as efficient and durable installations on all equipment where there is a chance of damage, injury or down-time as a result of runback.

Insufficient backstopping on conveyors and bucket elevators can be costly. Power failure of a few moments can flood an elevator boot with material being elevated and result in plant down-time running as high as $20,000 an hour. If holdback permits even slight backlash when motor is shut off, forces generated can be tremendous—especially so in on-off operation. Worn holdbacks have been known to rock until they ripped teeth off ratchet type clutches.

Positive backstopping is a necessary part of dependable and efficient movement of bulk materials. Bucket elevators with lifts from 6 to 130 ft and more for fine sand to five or more-inch rock, and belt conveyors over 2400 ft long that carry 300 lb per ft, cannot be permitted to run away without costly consequences.

Backstopping recommendations are based on a program instituted by the company to plan the types of holdbacks to be used on its equipment. Objective was to find a superior type of enclosed holdback with complete reliability. The device chosen as the maximum in holdback dependability and efficiency was a sprag-type clutch manufactured by the Formsprag Co., Van Dyke, Michigan.

One of the reasons for the choice was that the clutch does not permit one iota of slippage, even after long periods of use, and eliminates the backlash that ultimately leads to damage of the equipment. Another important consideration was the fact that the units require virtually no attention. Other types, such as the band brakes, do require adjustment and other periodic checks.

Application of the sprag-type backstopping clutch is simple. The most important point in mounting the unit is to get it as close to the head shaft as possible, so no part that can fail lies between the clutch and the mechanism it must backstop. accordingly, the Formsprag clutch is key-seated directly onto the main shaft at the head of the conveyor or elevator.

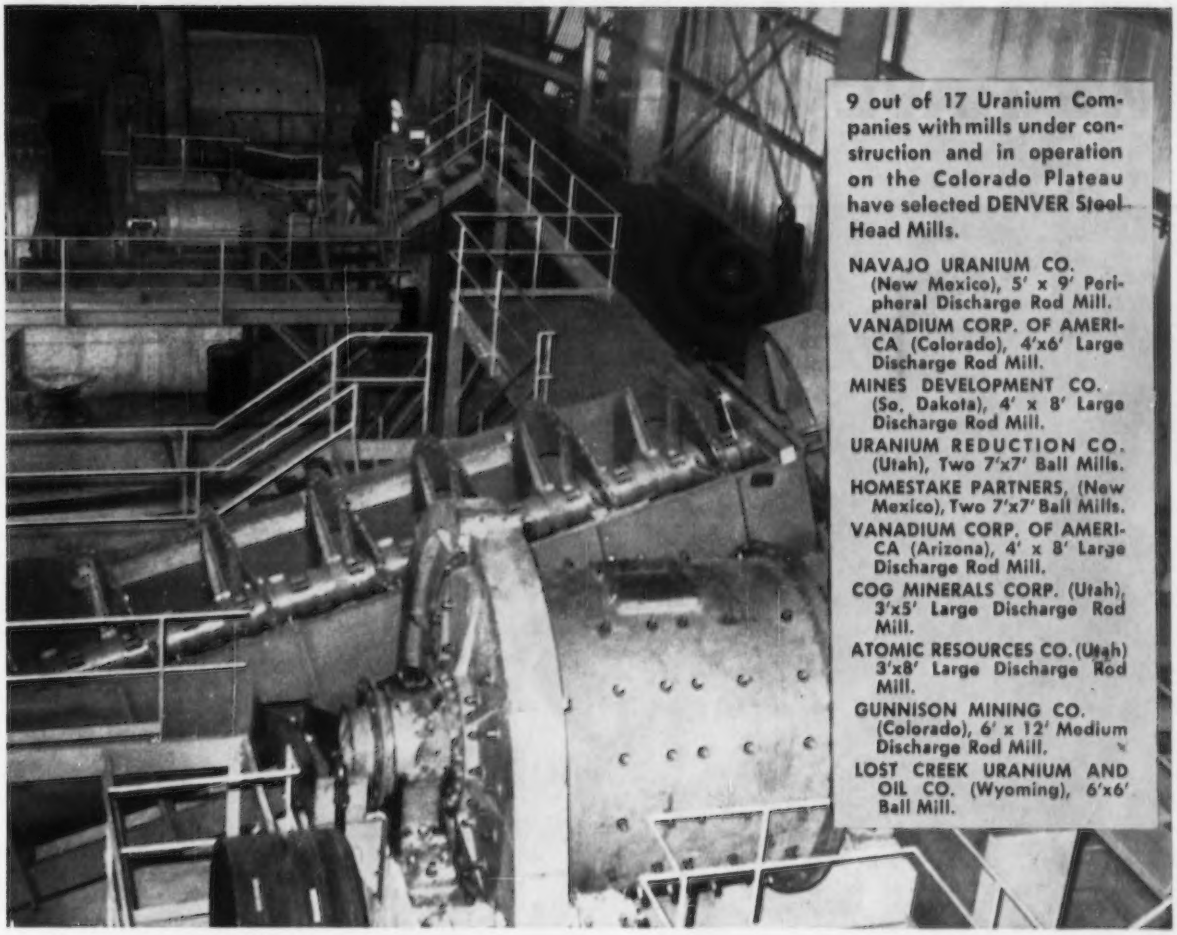
This installation is particularly desirable in any operation which requires stop-and-start sequence, such as feeding of material to a batcher. In this case, the holdback keeps the loaded equipment stationary until forward motion again is required. The installation also acts as a most efficient safety device in any continuous conveyor operation.

The Formsprag units are based on a unique design in which as many sprags as needed for the required torque are placed between two concentric races. Power is transmitted from one race to the other by wedging the sprags between the races. The sprags are kept in constant engagement by an energizing spring.

Thus, when the clutch is mounted on an elevator, for instance, the outer race is fixed to the body of the equipment. The inner race over-runs or "free-wheels" in the forward direction when the motor is in operation. When there is no forward motion, the sprags are wedged into an upright position and they grip the races instantaneously to prevent reverse rotation. Since there is an endless number of points within the concentric races at which the sprags may grip, there is no wear at contact points.

The backstops commonly used have torque capacities ranging from 3,160 to 4,250 ft-lb and will over-run at up to 600 rpm. Other standard high capacity Formsprag backstops are available with up to 136,500 ft-lb of torque capacity. Very high torque capacity in relation to clutch size is

Mr. Stuller is supervisor of conveyor application engineering department of Chain Belt Co., Milwaukee, Wis.



9 out of 17 Uranium Companies with mills under construction and in operation on the Colorado Plateau have selected DENVER Steel-Head Mills.

NAVAJO URANIUM CO. (New Mexico), 5' x 9' Peripheral Discharge Rod Mill.

VANADIUM CORP. OF AMERICA (Colorado), 4'x6' Large Discharge Rod Mill.

MINES DEVELOPMENT CO. (So. Dakota), 4' x 8' Large Discharge Rod Mill.

URANIUM REDUCTION CO. (Utah), Two 7'x7' Ball Mills.

HOMESTAKE PARTNERS, (New Mexico), Two 7'x7' Ball Mills.

VANADIUM CORP. OF AMERICA (Arizona), 4' x 8' Large Discharge Rod Mill.

COG MINERALS CORP. (Utah), 3'x5' Large Discharge Rod Mill.

ATOMIC RESOURCES CO. (Utah) 3'x8' Large Discharge Rod Mill.

GUNNISON MINING CO. (Colorado), 6' x 12' Medium Discharge Rod Mill.

LOST CREEK URANIUM AND OIL CO. (Wyoming), 6'x6' Ball Mill.

DENVER Steel-Head MILLS

SELECTED BY 9 out of 17 COMPANIES FOR NEW MODERN URANIUM MILLS

During the past 2 years Denver Equipment Company has received orders for 12 DENVER Steel-Head MILLS for processing uranium on the Colorado Plateau. These mills will grind approximately 5000 tons per day.

R. E. Lintner

DENVER MILLS were selected on the basis of merit, dependability and field proven performance. They have met, and in most cases exceeded specifications.

We want you to compare specifications of DENVER Steel-Head BALL and ROD MILLS before you select your next mill. Compare feature for feature, pound for pound, dollar for dollar, capacity for capacity.

R. E. Lintner, one of our Field Engineers with many years' experience, is available to assist you with your grinding problems. Make sure you select the BEST mill on the basis of price, specifications, capacity and maintenance. Write today! DECO Bulletin B2-B13 describes DENVER Mills in detail. Sizes to 8' x 20'. There's a reason why DECO Mills were selected—let us tell you why.

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"THIS D9 HAS DONE EVERYTHING WE HAVE TRIED IT ON YET!"

V. D. Eachus, Eachus Equipment Rental Co., Las Vegas, Nevada

This CAT* D9 Tractor with No. 9S Bulldozer is stripping overburden from gypsum in the Blue Diamond Corporation's operation, Blue Diamond, Nevada. The material is clay and rock. Says V. D. Eachus, owner of the unit: "This D9 has done everything we have tried it on yet. It is a big tractor and it does a big job. I have owned Caterpillar-built machines now for about fifteen years and find they stand up best on the toughest of work. Our dealer service is also tops."

That's typical of other reports about the Turbocharged D9. In every way, it's a big machine for your biggest, toughest jobs. It packs plenty of power — 260 HP at the drawbar and 320 HP at the flywheel. Its turbocharger, driven by the engine exhaust, packs air into the engine according to engine load, not engine speed, for greater efficiency. With bulldozer it weighs 35 tons, yet is as easy to maneuver as smaller machines, with hydraulic boosters providing power for steering, braking and master clutch use. And it's easy to service — for example, oil clutch, torque converter, transmission and steering clutches each can be moved individually.

To match your job needs, the D9 is available with torque converter or direct drive with oil clutch. For complete information, see your Caterpillar Dealer, who's a source of efficient service and parts you can trust. Ask him to show you facts and figures proving the D9 can step up your production. Better still, name the date — he'll be glad to demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED— THE HARD WORK

possible because the elimination of inclined surfaces permits insertion of more sprags in a given annular space. Ball-bearing construction, which maintains sprag concentricity, also insures smooth over-running and helps prolong clutch life. To reduce maintenance, the clutches are grease lubricated and require lubrication only twice a year. The units are symmetrical and may be mounted in the field for the desired rotation.

In studying the use of various types of holdback devices; the following evaluations were made in various areas essential to efficient and economical operation.

Sprag-type Holdback Has Advantages

	Band Brake	Ratchet Type	Formsprag
Effectiveness:			
Frequent service	Good	Good	Excellent
Periodic service	Unreliable	Good	Excellent
Auxiliary apparatus	Simple support	Heavy support and wiring for solenoid operated pawl	Simple torque plate
Maintenance	Moderate	Low	Negligible
Effect of dust or heat	Affects lining	No effects	No effects
Noise	None	None with solenoid Noisy without	None
Cost: Initial	Low	Medium	High*
Over life	High	High	Low

* Original cost is higher than other two but cost is moderate in terms of reduced maintenance, increased safety and life.

New Process Separates Zirconium-Hafnium

CLOSED REACTOR has a cooled lid which gathers hafnium tetrachloride. Lid is replaced by a clean one for purification.

PRODUCTION of hafnium-free zirconium is accomplished economically by a process developed by the Commonwealth Scientific and Industrial Research Organization of Australia by a method which is said to be "substantially lower in cost" than solvent extraction.

New method separates zirconium and hafnium tetrachlorides by preferential reduction of the zirconium to the trivalent state. Zircon sand is converted into zirconium carbide by heating with carbon in an arc or graphite-resistor furnace. Carbide is then transferred to a closed reactor with a cooled lid. Chlorine gas passes over the heated carbide to form and vaporize zirconium tetrachloride. Tetrachloride vapor is condensed on the cooled reactor lid and transferred to a second reactor containing powdered zirconium metal.

When heated under vacuum, the solid zirconium tetrachloride sublimes and is reduced to trihalide on reaction with the powdered zirconium. There is no reduction of the hafnium tetrachloride, and, as the reactor cools, the hafnium tetrachloride condenses on the lid. Zirconium trihalide collects as a solid at the bottom of the reactor, along with any unreacted zirconium metal that remains.

Lid containing the hafnium-rich chloride is replaced with a clean one and the solids reheated under vacuum. This step breaks down the zirconium trihalide to tetrahalide and non-volatile dihalide. Tetrahalide is removed for final processing to pure zirconium metal. Dihalide is left with any unreacted zirconium to serve as reducing agent for the next batch.

An option to purchase overseas rights for the process has been taken by U.S. Industrial Chemical Co., division of National Distillers & Chemical Corp.

Process Desulphurizes Iron

LABORATORY PROCESS developed by Battelle Memorial Institute for Diamond Alkali Co., Cleveland, Ohio, promises to desulphurize molten iron on a continuous basis. In addition, the process can remove some residual silicon from the melt.

In the process, caustic soda is fed continuously into an apparatus through which the molten iron passes. Caustic soda reacts with the sulphur, removing the sulphur in the slag. Both slag and iron continuously discharge from the reactor.

Adding a jet of oxygen into the mixing chamber makes it possible to remove substantial amounts of silicon along with the caustic sulphur-bearing slag. So far, laboratory results show that up to 90% of the sulphur content can be removed, according to N. H. Keyser and H. W. Lownie, both Battelle staff members.

Battelle thinks the process has a place in the production of ductile cast iron, as well as for desulphurizing pig iron ahead of steel production. Some metal is desulphurized by the steel industry today, and the trend is toward higher sulphur content in both coke and iron ore. This process might well find application in the Cyclosteel process for continuous production of pig iron from ore. Cyclosteel process produces an iron that contains considerable sulphur, phosphorus and other impurities.

WHAT'S NEW IN U. S. PATENTS

OLIVER S. NORTH

Exploration

Simplified and improved method for electromagnetic induction prospecting, particularly with airborne equipment. This method overcomes usual difficulties caused by changes in relative orientation of transmitting and receiving coils. E. H. L. Hedstrom and R. V. Tegholm. No. 2,794,949.

Mining

As a means of cleaning iron ores or other sticky materials from conveyor belt surfaces, leaf springs are utilized as wiper blades. Adherence of ore to cleaning bars is effectively prevented with this construction. A. D. Sinden, assigned to Stephens-Adamson Mfg. Co. No. 2,794,540.

Design for an improved rock-piercing blowpipe having a longer life, higher speed of penetration, reduced internal erosion, improved water cooling and increased efficiency of mixing oxygen with air. C. S. Arnold, J. J. Calaman, C. A Napiorski and D. H. Fleming Jr., assigned to Union Carbide & Carbon Corp. No. 2,794,620.

Design for a drill steel collar that is readily attachable and detachable. Expensive collar forging is avoided by use of this collar. C. E. Sears, assigned to Ingersoll-Rand Co. No. 2,794,661.

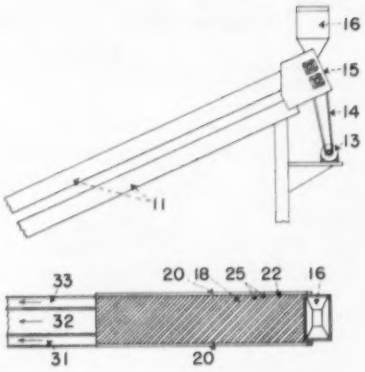
Improved adjustable jib mounting for a hammer rock drill which can be adjusted through a wide range of drilling positions, including a position close to the ground such as is especially desirable in flat hole drilling. J. C. Curtis and W. D. Fish, assigned to Joy Mfg. Co. No. 2,791,399.

Two patents disclose designs for cutter bits and holders. Bits are of rhomboidal shape and formed from roller bar stock by parallel slantwise cuts. Bits can be quickly replaced in the holders. A. O. Bruestle, J. R. Cartlidge and C. B. Krekeler, assigned to Cincinnati Mine Machinery Co. Nos. 2,791,413 and 2,791,414.

Ore Dressing

Flotation method for recovering titanium minerals from beach sands. Sand first is treated with a caustic, such as sodium hydroxide or potassium hydroxide, to remove the organic film that coats the particles, and accumulations of organic material are eliminated by usual desliming methods. With the organic film removed, the sand is more amenable to normal flotation practices, and titanium oxide minerals can be readily floated away from quartz. R. E. Baarson, assigned to Armour & Co., Chicago, Ill. No. 2,792,940.

Mr. North is patent consultant, Washington, D.C.



Improved apparatus for continuous dry vibration concentration of placer gold or other heavy mineral sands consists of a series of inclined separator trays. It is particularly useful in desert areas where water in quantity is not available. The machine is low in initial cost, high in capacity and economic in power requirements due to its relatively light weight.

In the side elevation view of this apparatus, two trays are shown for purpose of illustration although more than two generally will be used. The shaking mechanism shown comprises motor (13) belt (14) and vibrator (15). Framework consists of side members (11) with flanges.

Resting on the flanges are the trays (18) consisting of side pieces (20) and bottom member (19). Bottom of the tray is covered with a rubber mat (21) having ribs (22) disposed diagonally across the tray. Rib faces are vertical on the upwardly facing sides (23) and sloping on the downward facing sides (24). Channel-on sides pieces of the tray are positioned diagonally across the tray at approximately right angles to the ribs of the mat.

Finely comminuted raw material is fed to the tray from hopper (16). As the ore moves downward, agitation causes the heavy minerals to settle, and additional separation is effected by the ribs of the mat, with heavy minerals being moved towards the side of the tray. Concentrates are recovered from chute (33), tailings from chute (31) are sent to waste, and middlings from chute (32) are sent over the tray again. This separator is able to discharge as tailings from 50 to 75% of first run feed without any significant loss of microscopic mineral values. C. W. Carter. No. 2,794,552.

Hydrometallurgy

Solvent extraction method for purifying thorium from its aqueous solutions containing rare earths or water-soluble salts. Solution is extracted with a liquid organic solvent having an atom capable of donating an electron pair to a coordination bond, such as lithium nitrate, potassium nitrate or the like. F. H. Spedding and A. Kant, assigned to U. S. Atomic Energy Commission. No. 2,796,320.

Hydrometallurgical method for selective separation of copper from liquors obtained by leaching ores, concentrates or other solids containing copper with other nonferrous metals. Feed solution is adjusted to proper hydrogen ion concentration and then treated at elevated temperature with a non-sulphidizing reducing gas under controlled pressure. Copper powder is precipitated. F. A. Schaufelberger and P. J. McGauley, assigned to Chemical Construction Corp. No. 2,796,342.

Low-temperature process for hydrometallurgical precipitation of nickel and cobalt as powders having suitable physical and chemical properties for use as active seeding material in treating additional amounts of the solution. A sulphate of titanium, vanadium or chromium is used as a catalyst. J. J. Shaw and F. A. Schaufelberger, assigned to Chemical Construction Corp. No. 2,796,343.

Adsorption process for separating ruthenium, zirconium and columbium values from uranium. The values are adsorbed onto silica gel, which is then separated from the solution and treated. W. W. Schulz, R. A. Watts Jr., and R. L. Moore, assigned to U.S. Atomic Energy Commission. No. 2,796,424.

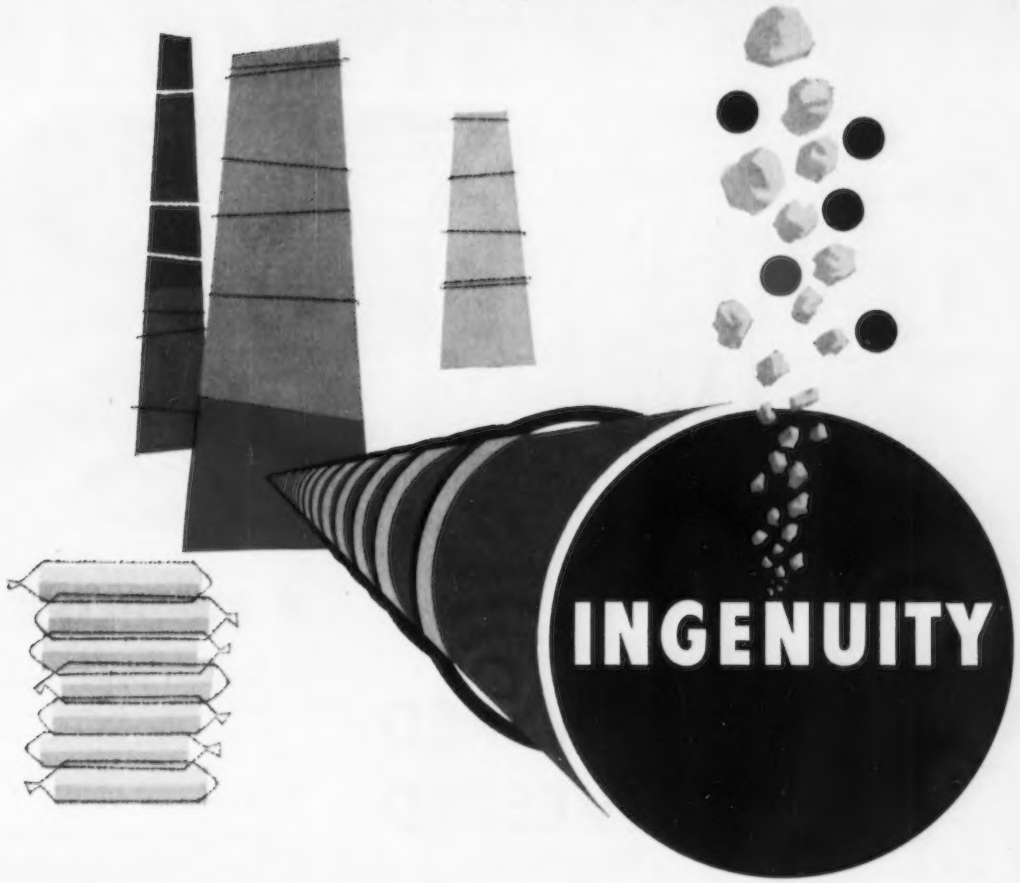
Process for treating liquors derived from carnotite and roscoelite-type ores for recovery of both uranium and vanadium. Dissolved uranium and vanadium values are reduced to the 4- and 3-valence states, respectively, and then separated by a double phosphate precipitation procedure. Impurities are removed in solution and associated supernatants can be eliminated by conventional filtration methods. Only a few relatively inexpensive reagents are required. W. F. Arendale and C. F. Coleman, assigned to U. S. Atomic Energy Commission. No. 2,797,143.

Pyrometallurgy

Process for obtaining hydrolyzable titanium sulphate solutions from slags derived from Canadian high-iron titanium ores. Slag is subjected to an oxidizing roast before sulphatization. Roasting minimizes loss of H_2SO_4 and avoids both fume nuisance and the subsequent necessity for oxidizing residual titanium solution. B. W. Allan, F. O. Rummery and J. M. Gilbert, assigned to Glidden Co. No. 2,794,702.

Improved method and apparatus for roasting comminuted sulphide ores, such as pyrites or arsenopyrite, so as to increase output per unit of apparatus as compared with previous practices. Roaster walls are suspended, that is, incremental parts are hung in a steel frame so that they do not depend on adjacent walls or sections for support. This construction provides marked advantage in use of refractories and prevention of gas seepage. T. S. Harrer, assigned to Allied Chemical & Dye. No. 2,795,496.

call KE for plant expansion or new facilities



1,250,000 barrel cement plant addition recently completed by KE for Marquette Cement, one of world's largest cement producers.

has made KE a major engineer-contractor serving the Minerals Industry

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Mining, transportation, beneficiation, materials handling, processing in cement, gypsum, coal, ferrous and non-ferrous metals facilities—these are but a few of the fields wherein KE serves the Minerals Industries—from economic analysis through start-up.

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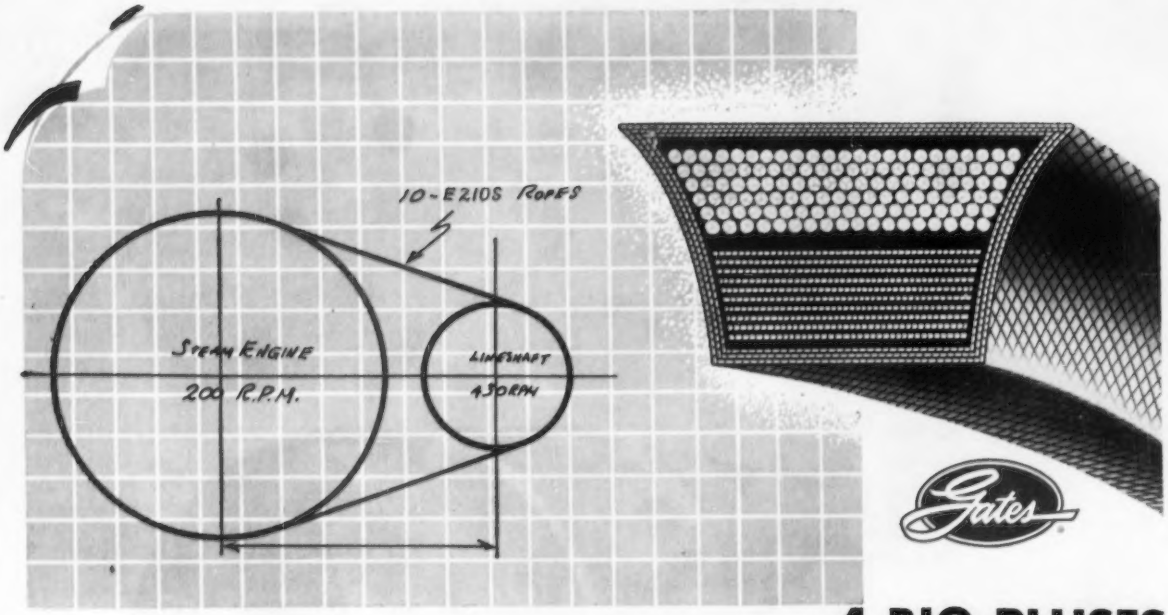

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On any new drive design—where you have limited space or you need to keep weight down—here is an important fact that can save you money:

A Gates Super Vulco Rope drive will deliver more horsepower per dollar invested than any standard V-belt drive.

Actually, the greater load carrying capacity of Super Vulco Ropes cuts down the number of belts required (5 Super Ropes do the work of 7 standard belts) . . . thus reducing the width of sheaves.

Sheaves with fewer grooves not only cost less, they weigh less, and take up less room—advantages that can easily improve the design and lower the overall cost.

A wealth of drive data is quickly available to you. Simply call your nearby Gates V-Belt Distributor (see 'phone book yellow pages) for a Gates V-Belt Specialist. Stocks available in industrial centers around the world. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

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✚ Handles shock loads

Super-strength cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads.

✚ Wears far longer

Concave Sidewalls (Fig. 1) increase belt life. As belt bends, concave sidewalls (U.S. Pat. No. 1813698) become straight, make uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . longer V-belt life.

Flex-Weave cover (U. S. Pat. No. 2519590) provides greater flexibility with far less stress on fabric. Cover wears longer—increases belt life.

✚ Provides Static Safety

High electrical conductivity is built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

✚ Resists oil, heat and weather

Special rubber compounds with which cords and fabric are impregnated make Super Vulco Ropes highly resistant to heat, oil and prolonged exposure.

TPA 76B

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OFFERS 3 BIG SAVINGS!

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The compact new rig shown here is just one example of how Alemite can furnish you a "custom-made" unit that fits your exact needs. Does the *complete* job! Shown equipped with the following standard Alemite products:

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- **Bank of 4 hose reels, including high-pressure, air, gear lube and motor oil lines.**
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LOOK FOR THE YELLOW TRIANGLE

Is Industry Creating A New Breed of "Bonus Babies"?

THE STARTING SALARIES offered to this year's June graduates give the impression that industry is creating a new breed of "bonus babies." This is the term baseball fans apply to sturdy youngsters whose talent for hitting and throwing gets them payments of up to $100,000 and other benefits for signing a contract.

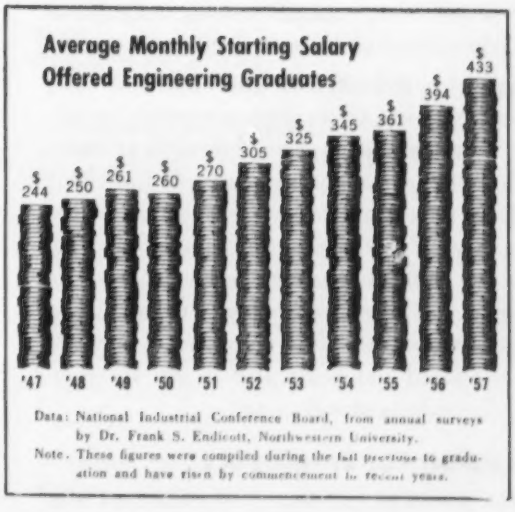
For several years industry's demand for young college graduates, especially in science and engineering, has outrun the number receiving degrees. Competition for these young people has steadily pushed up the starting salaries and has induced many companies to indulge in lavish recruiting programs. This year engineering graduates are being offered well over $400 a month, and even liberal arts graduates find numerous offers at $400 or more. Only ten years ago the salaries offered senior engineering students averaged less than $250 a month.

But any employer who assumes that high starting salaries alone will assure him the number of June graduates he wants is likely to be disappointed. A recent study by the McGraw-Hill Classified Advertising Division shows that most young engineers and scientists going into industry are more interested in their opportunities and in a company's future than they are in the size of their first paycheck.

Money Isn't Everything

In the McGraw-Hill survey, 2,596 recently-hired engineers and scientists employed in 57 companies listed the factors they had considered before accepting a position. The replies of the younger engineers and scientists—those with less than five years' experience—have great significance for employers who want to make any impression in the highly competitive market for college graduates.

- **Potential growth of the company** was listed by more young engineers and scientists than any of the 42 other items on the list as a factor that influenced greatly their decision in accepting a position.
- **Challenging opportunity** was second.
- **The company's prestige and reputation** ranked third.



● **Progressive research and development program** was fourth.

● **Starting salary** ranked only **seventh.**

Job and Future Most Important

As a group, the factors relating to the nature of the job, its future and the company's future had by far the greatest influence in attracting young engineers and scientists to their present positions. These include three of the top four attractions—potential growth of the company, a challenging opportunity and a progressive research and development program. Other factors in this group are the company's facilities, quick advancement, self-direction or little supervision, chance to work in a certain field, small size of company and rewards for individual accomplishment.

The second most important group of attractions had to do with prestige. These include the company's prestige and reputation, executive or professional standing and association with leading men in the field. **Third in importance were financial considerations**—starting salary, regular salary increases, financing of relocation, paid vacations and holidays.

A less important group of factors influencing young scientists and engineers were essentially social. Geographic location and educational facilities in vicinity ranked fairly high. But recreational facilities, suburban or country living, pleasant housing and cultural considerations had little appeal.

Ranking lowest, by a good margin, were factors having to do with security—permanent position; health, life and surgical insurance; retirement or pension plan; and sick leave.

It is interesting to note that some of the factors which influenced the **smallest** percentage of young engineers and scientists were country club memberships, use of company car, at-cost or low-cost eating place, travel opportunities abroad and being able to buy the company's products at a discount.

A Lesson For Employers

The lesson of this survey to employers who hope to recruit more young engineers and scientists is clear. High salaries and other financial appeals are important. But, **at a time when high starting salaries are offered in abundance, our young graduates are interested even more in being with companies that will grow and in jobs that will permit them to grow. They are interested in jobs that offer opportunities for advancement, financially and professionally.**

* * *

Were the young scientists and engineers who participated in the survey trying to impress somebody with their motives? If so, it could only have been to impress themselves, for all were asked to return their questionnaires unsigned.

What Factors Influence the Job Selections of Young Engineers and Scientists?

Factors Influencing Decision Greatly	Percent Listing Factor
Potential growth of company	55%
Challenging opportunity	53
Company's prestige, reputation	44
Progressive research and development program	41
Geographic location	37
Permanent position	35
Starting salary	34
Educational facilities in vicinity	33
Regular salary increases	31
Chance to work on specific project, or in certain field	27
Company's facilities (laboratories, technical libraries, etc.)	25
Tuition for graduate study	25

Based on replies by recently-hired engineers and scientists with less than five years' experience to questionnaire distributed by McGraw-Hill Classified Advertising Division.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

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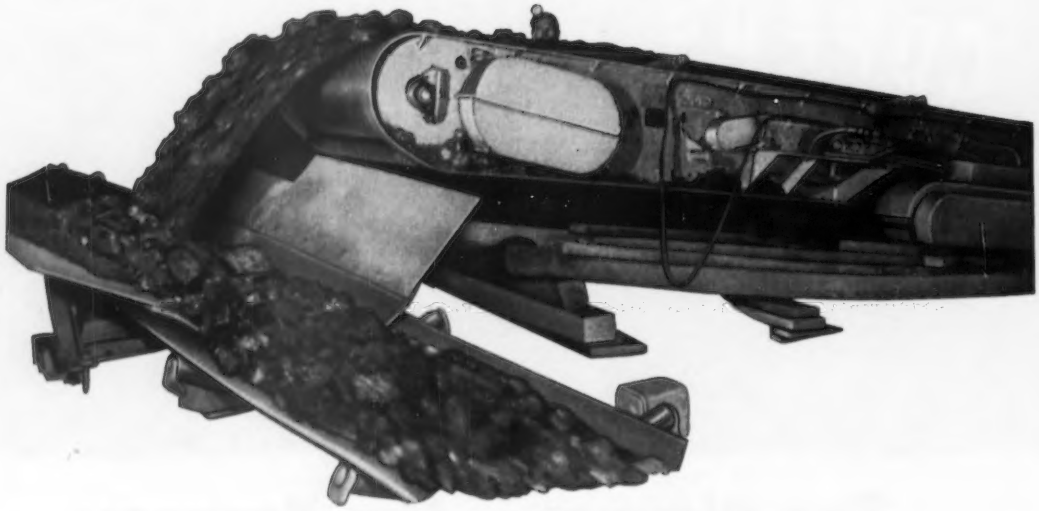

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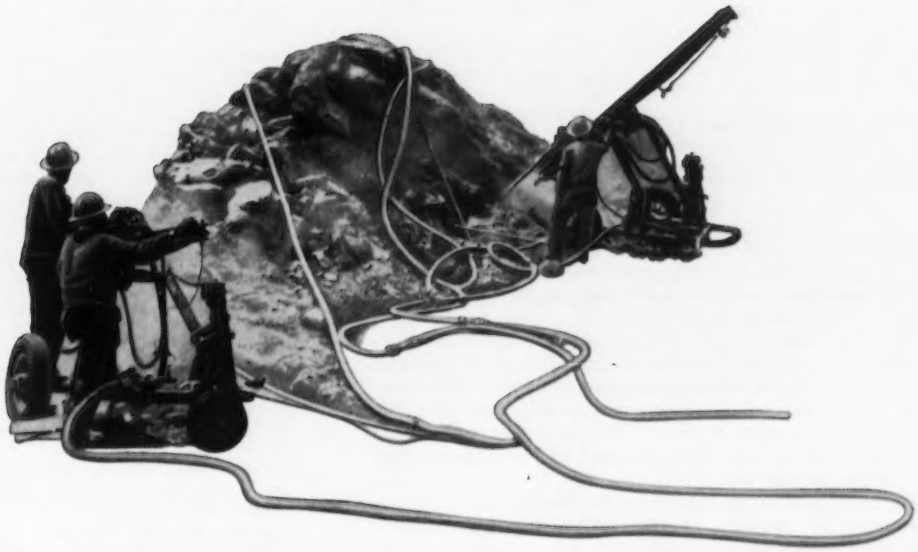

Both Gold Bond Air Hose with yellow cover and Super Service and Endurance Belting... defy weather, hard wear, abrasion and abuse.

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A Division of Acme-Hamilton Manufacturing Corporation

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WASHINGTON IMPACT

Highlights

PROSPECTING ON CAPITOL HILL—Last winter, the mining industries looked longingly at the new 85th Congress to help them through a serious economic readjustment period. As the first session of the 85th winds up, its record pans out as one of compromise, promise and disappointment—few accomplishments, but considerable hopeful progress.

In areas of major importance to mining, here's how the situations stand:

The "Seaton Doctrine"—the first long-range package Government support program for mining was born. Industry has called it an abortion, but it nevertheless set a precedent. It won't pass this year, but parts of it are likely to be enacted next session. (See story this page.)

Trade Policy—a rising protectionist sentiment has made its mark. The lead-zinc tariff proposals (see story this page) didn't satisfy many producers, but chances for a general quota bill next session are good. Import restrictions on grounds of "defense essentiality" may be broadened as a result of the domestic oil producers' victory. Barter has been practically cut in half by new Administration regulations, but Congressional pressure may force a let-up in restrictions next year.

Stockpiling—the budget-cutting mood prevailed, with tungsten the unhappy victim. But Government purchases will continue piecemeal for some time to come.

Taxes—again, nothing this year, but strong hopes for some relief, particularly for small mines in 1958, an election year.

Mergers—another paradox, with sentiment strong for passing domestic controls next year in the face of a rising trend toward international combines.

A final evaluation must await next year's Congressional action. The first session hasn't brought any hurrahs from the mines, but mining influence on Capitol Mill is keeping hopes alive.

BRIGHTER NICKEL OUTLOOK—Government nickel experts have turned bullish in a big way. The current market shortage still hurts, and will continue to for some time, but Washington now thinks it sees the end in sight—possibly by 1962, certainly by 1965.

The tipoff came last month when General Services Administration refused International Nickel Co.'s bid for an incentive purchase contract. Inco wanted one similar to the deal negotiated recently with Freeport Sulphur, for production of previously undesirable ores in Cuba via a new process.

The present Washington attitude means the end of a number of programs aimed at spurring production:

A 50% boost in the production facilities goal eligible for fast tax write-offs—from 300-million lb annually to 440-million—has been closed. Office of Defense Mobilization expects output to reach 450-million by the end of 1961.

Incentive purchase contracts, including premium price deals, underwriting of "unusual development costs," acceptance of so-called "put" clauses, will be hard to get from now on. The Government will still buy some nickel, but less than it has been buying. Outright development loans are out.

Also, Government has expanded expansion at its Nicaro, Cuba, plant to 50-million lb a year, tightened military priority allocations, and is deferring all purchases for the stockpile, diverting large quantities to industry.

SMALL BUSINESS LOANS—The Small Business Administration, certain to be made a permanent agency by the Administration with Congressional okay, may prove a new source of financial aid to the mining industries. A group of nearly 100 small tungsten miners in California are exploring possibilities of setting up a cooperative association to get help from SBA, since tungsten purchase funds were cut out of the Interior Department's budget by Congress.

Other mining interests have received loans from SBA previously, but this is the first time a group has proposed banding together for that purpose. The Government is studying the proposition.

Lead-Zinc Import Bill Faces Another Battle

LEAD-ZINC TARIFF PROPOSALS got an airing in House and Senate tax committees late last month—before the House Ways & Means group and the Senate Finance Committee. But the final solution is still uncertain.

The Administration's proposal in the "Seaton Doctrine" long-range mining program calls for sliding scale import excise taxes to replace current tariffs, aimed at stabilizing prices at about 16c per. lb for lead and 13c for zinc. Industry spokesmen flatly oppose these rates as too low, favor 6c tariff boosts and/or outright import quotas instead.

The Administration rates are a frank compromise, accepted somewhat reluctantly by the trade-minded State Department. Opponents of the Seaton Doctrine feel it would take long negotiations under GATT (General Agreements on Tariffs and Trade) to get even these rates put into effect in a year's time.

The House also has before it a substitute plan sponsored by Rep. Walter Bearing (D-Nev.), calling for a fixed quota which could be flexibly spread among importing nations on a prorated basis. This measure will at least be considered in light of its possible benefits to Canada, currently up in arms over a number of economic gripes against the U. S. which Washington is anxious to settle.

The hearings uncovered an even knottier problem with the Administration tariff proposals. Under an item-by-item listing of lead and zinc ores, concentrates and contained shipments, the official bill failed to include brass items. Initial estimates are that some 47-million lb of brass are imported into the U. S. annually, containing some 17-million lb of zinc.

This would not be affected by the new excise taxes under the official proposals. Result of this discovery at the hearings was that domestic brass producers launched a violent protest. They will either try to get brass included in the new tariffs, or fight the whole proposal in-toto.

Barter Deals Decline; ODM's Purse Is Thinner

BARTER under the new restrictive regulations (*E&MJ* June 1957, p 118), dropped off to $6.5-million in May—two-thirds for chromite, the other third divided between lead and zinc. Agriculture Department officials admit current negotiations are practically nil in comparison with previous deals.

Sen. Hubert Humphrey (D-Minn.) held extensive hearings on the program last month, but is unlikely to follow up Congressional criticism of the new regulations with a directive to Agriculture Department to ease them off at this time. Agriculture Secretary Ezra Benson

has stated flatly he does not intend to relax the new restrictions. However, some relaxation may be demanded if barter deals fall off too far too fast—a lot of the pressure for this coming from farm groups as well as materials brokers.

A key to the future of barter lies in the ability of the Office of Defense Mobilization to reimburse Agriculture's Commodity Credit Corp. for strategic materials received in exchange for domestic drop surpluses.

The ODM budget has been cut substantially this year, with stockpile funds taking the brunt of the reductions. ODM now figures it has about $65-million to pay CCC for stockpile items received through barter this fiscal year, far below the dollar value of metals and minerals barter has been bringing in recently.

ODM is preparing a list of strategic materials it will pay CCC for, in order of priority. This is a refinement of its regular, periodic shopping list to GSA, authorizing certain metals and minerals as acceptable. This list is classified but lead and zinc are said to be far down on the priority list of some 27 metals and minerals.

The rest of materials exchanged for bartered crops go into CCC inventory, pending their transfer to Agriculture Department's supplemental stockpile. To effect this transfer, Benson must go to Congress for the funds to carry out the bookkeeping transfer of accounts, a complicated procedure which would be charged against the Department's already tight budget. Benson is obviously reluctant to ask for more money.

But the concern in some mining circles is that materials held in CCC inventory before transfer to the supplemental stockpile could conceivably be sold by the Government on the open market, since the Congressional authorization required prior to Government sales applies only to items held in stockpiles.

Congress Studies "Doctrine"

HEARINGS ON THE "SEATON DOCTRINE" long-range program are underway in Senate Interior Committee. These hearings will touch on the proposals for new exploration and development incentives, and bonus production payments.

Tungsten producers are also appearing to protest the Congressional cut-off of stopgap Government support purchases, and to question Administration witnesses on their promise to "re-evaluate" the tungsten market picture if Congress refused the purchase money.

Senate committee staffers will also question a so-called "pauper's oath" in Seaton's new Defense Minerals Exploration Administration proposal. DMEA loans, under the new plan, would be offered only when the miner can show he cannot get the money elsewhere. One proposal is to make this "oath" apply only to applications for loans over $25,000.

This compromise is aimed at easing small miners' red tape.

Labor This Month

MINE-MILL SURVEYS UNEMPLOYMENT: Hurt by what it describes as a steady decline in jobs due to metal imports and falling markets, the International Mine, Mill and Smelter Workers is trying to stem the tide. First effort is a survey of the nonferrous industry, with a special look at mine shutdowns and loss of jobs in mines still operating. Mine-Mill leaders hope to complete the report this month—with some attempted solutions. But, according to union leaders, any big change in the trend must come from new markets developed by industrial leaders.

The long-range view is being supplemented by some union warnings to members about current unemployment. Noting that many members are now out job-hunting, the union's paper—Mine Mill *Union*—advises them:

- Don't leave present camps without checking in advance for job prospects in other camps.
- When a miner moves to another state in search of a job, he's warned that his unemployment compensation is going to be delayed.

First steps to check the trend are being led by Mine-Mill secretary-treasurer who is readying a plea to the Federal Government to re-open shut-down mines and provide new jobs. This will be Mine-Mill's biggest campaign on the Federal level this year; the legislative drive on mine health and welfare is being dropped because legislation prospects are nil for the rest of this session.

GOVERNMENT SCANS UNION OFFICERS: The Congressional racket revelations will fail to stir up any corrective legislation this session—but the vacuum is being partly filled. The Taft-Hartley Act requires annual financial reports to the Secretary of Labor, and these are being expanded to include some information on union leaders' financial dealings.

Borrowing from union treasuries, gifts and outright thievery have been uncovered by the Senate racket investigators. Labor Secretary James P. Mitchell, in an attempt to prevent some of these actions in the future, had amended the reports to include questions on any union loans or gifts to officers in excess of $500; any outstanding loan at the end of the fiscal year. Ever since T-H was passed 10 years ago, the feeling is that these reports were ineffective as far as getting the proper information is concerned. Now, with the Mitchell action, all unions that want to use the National Labor Relations Board and other services must file these more intricate reports along with the non-Communist oath of the officers.

LABOR PROBE FROM A TO Z: The Senate Select Investigating Committee has widened its horizons. A new agenda drawn up by the eight-man committee proposes an intensive investigation of labor activities—and not just racketeering. As a result of the new targets, the Committee has revised its probe time-table. Already near the end of the first Congressional session, the Committee now plans to run at least two more years.

Officially, here are what the investigators are, or will be, looking into: labor-management collusion, improper activities by management to prevent union organization, undemocratic procedures by unions, misuse of union funds, racketeer-controlled unions, secondary boycotts, bribery and extortion, organizational picketing, violence, paper locals and improper political activities by unions and management.

There are two "sleepers" in this list that may bring in some industrial unions that had not been on the schedule. The plan to investigate political activities almost surely means the United Auto Workers' Walter Reuther will sit in the witness seat. And the secondary boycott target may result in an extensive investigation of union organizing. What this growing agenda means is that labor will get some thorough probing that may extend far beyond the original racketeering yardstick.

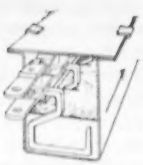
Too, by introducing the new elements, there'll likely be some heavy political maneuverings between Democratic and Republican committee members. Democrats normally benefit from union contributions to a greater extent than their fellow Congressmen—and they'll be anxious to avoid any stigma—or legislative check—on labor and politics. This will get even hotter if the hearings carry on until the 1960 elections—which is quite possible.

STEPHENS

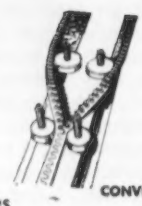
the big name

BELT CONVEYORS

VIBRATING CONVEYORS



REDLER
CONVEYORS, ELEVATORS



ZIPPER
CONVEYOR-ELEVATORS

PAN CONVEYORS

BUCKET
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BIN GATES--
ALL KINDS

-ADAMSON

in ore conveying systems

In the mining industry—where toughest demands are placed on conveying equipment, Stephens-Adamson engineered systems continue to establish trouble-free low cost per ton performance records. Product design that meets every service demand stems from more than fifty years of experience in engineering and building conveying systems for the mining industry.

Under or over the ground operations find S-A systems doing the meanest jobs, delivering steady volumes of mine products from point of recovery to point of delivery.

In large or small tonnages, ore handling economy gets first consideration from S-A engineers. They draw from a complete line of manufactured products which have proven their design efficiency on thousands of locations.

Amsco manganese steel pan feeders are designed to absorb the terrific shock of falling ore. S-A feeders get tougher with usage, are built in great range of sizes.

One of numerous S-A specially engineered boom installations used to convey ore to storage. Such equipment permits utmost mobility in stacking operations.

Four scalping screens supplied by Amsco feeders. S-A screening equipment is built to withstand the shocks transmitted while scalping and screening large ore sizes.

STEPHENS-ADAMSON MFG. CO.

4 RIDGEWAY AVENUE, AURORA, ILLINOIS
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BELLEVILLE, ONTARIO

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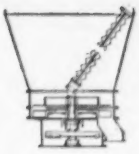


CIRCULAR BIN DISCHARGERS

SEALMASTER BALL BEARING UNITS

S-A manufactures a wide range of material handling products in three complete plants in U. S. and Canada.

- Belt Conveyors
- Belt, Pan & Plate Feeders
- Ship Loading Boom Conveyors
- Stacking Conveyors
- Storage & Reclaiming Systems
- "Natural Frequency" Vibrating Conveyors
- REDLER Conveyor-Elevators
- ZIPPER Conveyor-Elevators
- Conveyor Belt Cleaners
- Headshaft Holdbacks
- Grizzlies & Screens
- Centrifugal Pilers
- Bin Gates & Tunnel Gates
- Car Pullers & Spotters
- Bucket Elevators
- Skip Hoists
- SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above products.*

TRADITIONAL PICTURE at the annual association meeting reflects atmosphere created by the excellent organization.

Idaho Mining Association Session Draws 300

THE BELL CLANGED on top of the old opera house at Sun Valley Idaho, but nobody came to the meeting. It was just too sunny and nice outside. So Harry Marsh, secretary of the Idaho Mining Association stuck his head out of the front door of the opera house and hollered "Hey it's time to start" . . . and the association's meeting got off to its usual casual beginning. Over 300 people showed up for the Idaho meeting, July 14, 15 and 16.

Harry's meetings are famous because he confines all talks to morning sessions, all fun to the afternoon and evening informal get-togethers and he doesn't tolerate speeches at the banquets. His meetings are so popular that a group of mining men tried to convince the visiting secretary of Wyoming's fast growing mining industry to hold similar meetings on alternate years at Jackson Hole. It was thought that the backdrop of the Tetons mirrored in Jenney Lake might inspire top mining men to solve some of the industry's most pressing problems.

Despite the casual pleasure that Sun Valley has to offer, the meeting was shot through with an undertone of distress. Idaho and neighboring Western states are really hurting from the current metal price slump. LeRoy Traeger, outgoing chairman of the meeting, said that since 1950 more than 50% of Idaho's operating mines have had to shut down.

Speaking to a cross-section of mining men at the meeting, one could easily conclude that they consider "foreign dumping of metals" to be the dominant cause of distress. Resolutions at the meeting and talks by nationally known speakers indicated that the eleven Western States look to some form of tariff or import control to correct the situation, and a Federal long-range minerals policy, implemented by legislation to solve most of mining's problems.

But both Sam Williston, head of the Minerals Advisory Committee of the Western Governor's Council, and Idaho's Gov. Smylie who attended the recent Governor's meeting at Williamsburg made it clear that the job of obtaining relief would be tough. For one thing, Governors and Senators of non-mining states are not showing too much interest in the plight of the Western states and they will have to be sold on the merits of the program. In casual talks at the meeting it was hinted that Western Senators might even have to do a bit of vote trading or log rolling with Southern Senators who are smarting in the Civil Rights controversy in order to get a good mining bill through.

Uranium and atomic energy dominated the topics of the first session. Donald Walker, of AEC's Idaho operation office, said that more than 400 individuals and companies are now licensed to use isotopes and already research with these materials promises to save the agriculture, food, manufacturing and other industries hundreds of millions of dollars yearly.

M. H. (Sam) Bartz of Phillips Petroleum Co. did a fine educational job of explaining cross-sectional neutron capture and the importance of this property in influencing the selection of metals in reactor design. He classified metals in three groups—according to their neutron-stopping characteristics.

1. Low cross-section metals. These are beryllium, magnesium, zirconium, lead, aluminum and tin. He said zirconium appears to offer the best potentialities for reactor design in this group.

2. Intermediate cross-section metals include zinc, columbium, iron, molybdenum, vanadium, titanium and stainless steels containing chrome, cobalt and nickel.

3. High cross-section metals include manganese, tungsten, cobalt, silver, hafnium, boron and cadmium.

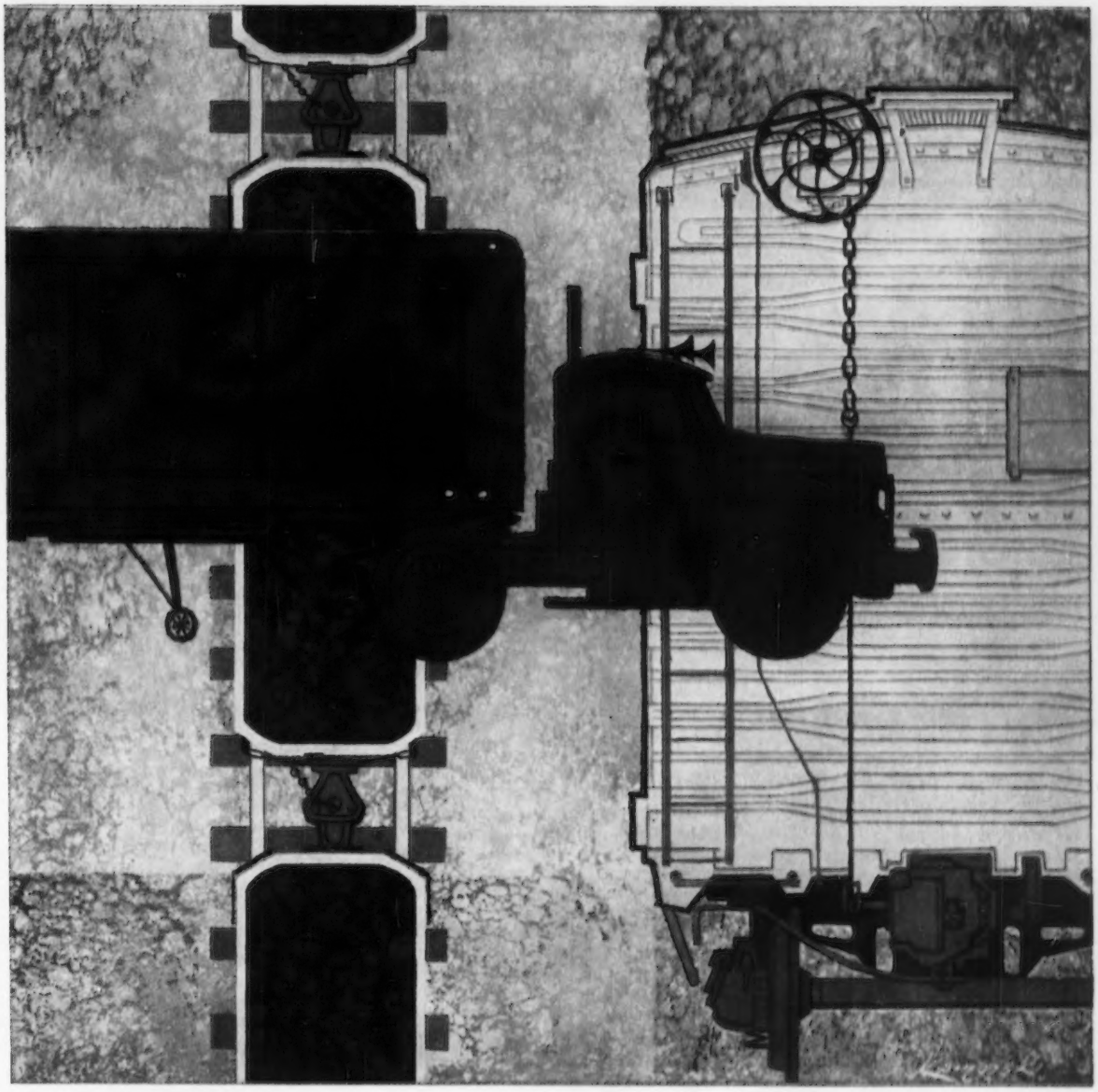
The relative order of neutron capture ability by these three groups is 1 for low, 5 for intermediate and 2400 for high. Careful study in this field will influence the use of large tonnages of metals in future reactor construction.

Colin Caldwell of Westinghouse covered the field of reactor design and explained pressurized water reactors in detail.

Mr. Caldwell said that in testing metals in reactors it was found that 0.2% of a gold sample was converted to mercury in 5 days, and about 10% in 20 days. Key question of the convention—"Is this reaction reversible"—no answer yet.

M. K. Hannifan said that even though production at Anaconda's Butte operations had established this area as the "richest hill on earth" current and future expansion plans would enable Butte to retain the title. He illustrated the new Berkeley pit with slides. Reserves here total more than 100-million tons of pit ore. The new "Northwest Project" pit is developing another "substantial" copper-zinc orebody. New projects at Butte will raise the production from 43,000 tpd at present to 50,000 tpd. The Berkeley pit is 500 ft deep, about 1 mile long and pit ore runs about 254 ft in thickness, capped by about 242 ft of waste.

R. D. McCall of Ingersoll Rand's technical staff illustrated new down-the-hole drills which are showing these ad-



JALTEN low alloy, high-strength J&L steel

provides equal strength with lighter weight

Jalten permits high design loads with reduction in section. Usual reduction is two gages with weight saving as much as 25%.

High strength of Jalten is the result of balanced chemical composition, carefully controlled during production. Strength is retained through fabrication and welding without further heat treatment.

Jalten is available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalten can be purchased in three grades to meet specific requirements for high strength, formability, impact, resistance to abrasion and corrosion.

Your local distributor can supply you with information on Jalten, or you can write direct to the Jones & Laughlin Steel Corporation, Dept. 412, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J&L STEEL

Jones & Laughlin

. . . a great name in steel

vantages over other types. They cut down power transmission losses through the stem; drill straight uniform holes necessary for powder economy, supply independent positive bit rotation, drill at higher speed than many other types. Units can be used to drill pilot holes for raises, ventilation and drainage holes, deep exploration holes, and are even mounted on jumbos to drill horizontal holes in tunnels. Development work will bring out down-the-hole drills in excess of the 7-in. size now made.

One of Idaho's most substantial rare-earth and heavy mineral placer deposits, the Bear Valley property of Porter Bros., was described by Robert Lathrop. Two dredges, a 4¼-cu ft unit and a 6-cu ft unit are now mining the alluvial deposits.

Sam Williston explained a significant cause of the serious condition of the wordwide mining industry by pointing out that wars and emergencies had forced the industry to develop over-production-capacity. He said that the mercury industry could produce 25% in excess of civilian needs. Lead and zinc producers have an excess capacity of 10 to 15% and the tungsten industry is geared 40% too high for world civilian needs.

He predicted that the U. S. could "get into an awful lot of trouble" if it persists on its policy of holding the nation internally to a paper standard of currency, but operating with the rest of the world on a gold standard.

Williston also summarized the deep concern which Western Governors are showing toward the present mining slump. If the mining industry including oil and gas were to collapse in New Mexico the state revenues would be cut by some 75%. Other western states are dependent on mining for payroll prosperity and tax revenues to a lesser but very vital extent.

The Need for PR

S. S. (Sandy) Klein showed that the mining industry could do a much better job in public relations work from the local to national level. Before the meeting he exhibited pages of a recent Congressional hearing on tungsten which added up to a thoroughly botched-up job and just didn't present the case of the tungsten miner in an intelligent or convincing manner at all. Some of the people in the audience began to wonder a bit about who should be the spokesmen for the mining industry. To say the least, public relations appears to be one field in which the mining industry has not distinguished itself.

Al Knoerr, editor of *Engineering and Mining Journal*, stuck his neck out at the end of a talk on long-range metal predictions by saying that the economic state of the nation was not as gloomy as it appeared to mine producers and that he thought that some metal prices would turn back upward before the end of the year.

Newly elected officers of the Idaho Mining Association include Wallace G. Woolf, president, L. F. Randall first vice preisdent, E. V. Douglas, second vice president and Harry W. Marsh, secretary.

NEW $18-MILLION refinery at Boron, Calif., includes four 230-ft thickeners and anhydrous borax plant, foreground, which takes sodium borate decahydrate.

U. S. Borax Plans Full Output Next Month

U. S. Borax & Chemical Corp.'s changeover from underground to open pit mining at its Boron, Calif, borax property is now complete, and the new $18-million refining plant at the site, in partial operation, is to be in full production by end of September.

The conversion stems from the company's decision to boost production (it now turns out 70% of the nation's borax) by going into lower-grade ore deposits. Open pit method was the most economic way to exploit these deposits, the company decided. And because it would be prohibitive to ship low-grade feed to the firm's refinery at Wilmington, Calif., U. S. Borax made the decision to build a refinery at Boron.

Some 9-million tons of overburden had to be stripped before full-scale open pit mining could begin. Isbell Construction Co. was contractor for the stripping work. The mining is done by U. S. Borax.

This is how the mining-refining operation is set up:

Ore is blasted out of 50-ft-high benches, then picked up by 3 cu yd electric shovels and loaded into 24-ton dump trucks for haulage to the primary crushing plant. (When the pit is further along, the crusher will be moved down into the pit, and a belt conveyor will deliver ore to the plant.)

The ore is broken down to 4 in. in the primary crusher and then to ¾ in. in a fine crusher. The second unit utilizes a hammermill in closed circuit with vibrating screen.

Next process separates the sodium borate from the clay by dissolving the sodium borate and discharging the insoluble clay as a muddy slurry at nearly boiling temperatures. The coarser gangue is separated out first by passing it over a screen. It and the slurry are pumped to the tailings pond, the slurry having first passed through a countercurrent decantation system employing four thickeners to take out the remaining borax values.

The borax solution then is pumped to vacuum crystallizers for processing into sodium borate decahydrate and pentahydrate. Centrifuging and drying are the final operations.

A notable feature of the plan is the system for maintaining a constant grade of plant feed. This is how it is done:

1. Ore is extracted from clay and borate strata at the same time, and loads from different horizons are fed alternately into the primary crusher.
2. After primary crushing the ore is stacked in four separate piles to permit further blending.
3. Ore leaving the fine crusher is stored in 1,000-ton bins. Grade of ore in each bin is analyzed, and ore is taken from the various bins in the proportion necessary to match the standard set up for the dissolving-plant feed.

Ore is transported by belt conveyors in the operations between open pit and dissolving plant. From then on the borax solution is pumped.

Alcoa Expands Smelter And Integrated Plant

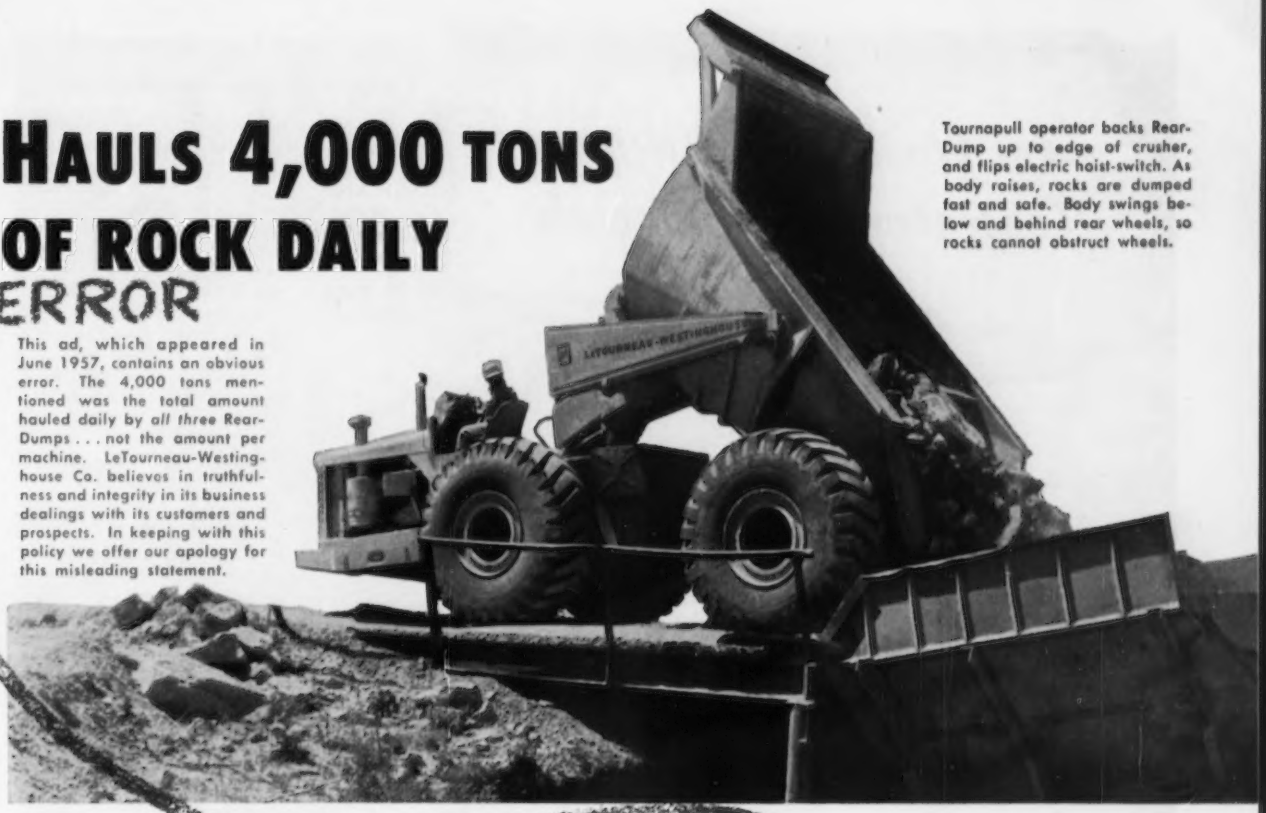
Capacity of Alcoa's Davenport, Iowa, aluminum rolling mill has been raised to 36-million lb per month with completion of the company's $54-million expansion. Latest expansion, which brings total cost of the facility to $130-million, has produced an integrated sheet and plate mill with 72 acres under one roof, with a plate stretcher which has a pulling force of 16-million lb, a 160-in. hot rolling mill, a 100-in. cold rolling mill, furnaces and a $13-million series of foil-rolling mills.

Alcoa also announced that a fifth potline will be added to the company's smelter at Wenatchee, Wash. at a cost of $10-million.

HAULS 4,000 TONS OF ROCK DAILY

ERROR

This ad, which appeared in June 1957, contains an obvious error. The 4,000 tons mentioned was the total amount hauled daily by *all three* Rear-Dumps . . . not the amount per machine. LeTourneau-Westinghouse Co. believes in truthfulness and integrity in its business dealings with its customers and prospects. In keeping with this policy we offer our apology for this misleading statement.



Tournapull operator backs Rear-Dump up to edge of crusher, and flips electric hoist-switch. As body raises, rocks are dumped fast and safe. Body swings below and behind rear wheels, so rocks cannot obstruct wheels.

An abundant supply of base material was vital to Broce Construction Co., Dodge City, Kansas, when they began putting an 18″ base on a 10-mile section of highway. Nelson Bros. Quarries, La Harpe, contracted to supply Broce with more than 400,000 tons of stone and sand for necessary base material. In order to maintain the continuously high rate of aggregate production needed, Nelson Bros. relied on their 3 high-speed, 22-ton LeTourneau-Westinghouse C Tournapull Rear-Dumps. These fast-stepping haulers high-balled material from pit to crushing plant . . . hauled 4,000 tons of blast rock daily per machine.

Note big 22-ton rock load in heavy, welded-steel Tournapull Rear-Dump body. On this rugged pit job machines successfully withstood much of this hard pounding.

Average 22 tons of rock per load

At Nelson Bros.' quarry, 3 mi. northwest of Reading, C Rear-Dumps worked with 2½-yd. shovel. Their short 90° turn radius enabled operator to maneuver machines easily, and spot fast under dipper. Each L-W Rear-Dump was loaded with 22 tons of blast-rock in 1¼ min. Rear-Dump's wide 8'9″ bowl, with low rear-entry, provided large, easy target area for shovel operator . . . reduced spillage and clean-up. Since shovel operator did not have to "lift" dipper high to get in and out of bowl, he saved valuable time on bucket's swing-cycle. This, plus time saved in hauling, maneuvering, and dumping, enabled Rear-Dump to make more round-trips . . . haul more tonnage per working-day.

Big brakes add safety on downhill hauls

'Pulls' multiple disc air brakes on all 4 wheels provided 3,762 sq. in. of braking surface for safe hauling on down-grades. At crusher, operator swung in fast . . . set rear-wheel brakes . . . and touched electric switch on control panel to activate hoist-motor and raise body. As bowl tilted, it swung discharge lip below and behind rear wheels . . . kept rocks from slipping underneath wheels as Rear-Dump fed load directly into crusher.

"These machines beat anything"

Supt. Carl A. Nelson reports his Tournapull haulers work profitably and efficiently. He said, "We have had excellent service from our Rear-Dumps. They haul from quarry pit to crusher, and have to take abuse on that type of work — but they are plenty rugged to take it." Nelson added, "They have plenty of power . . . can say we've had trouble-free service. We've worked all winter, in all kinds of weather. We can always depend on quick, easy starting on coldest days. These machines beat anything I've seen."

Heavy-duty haulers for tough jobs

For rugged, heavy-duty haulers to handle those tough jobs at your quarry, investigate the advantages of Tournapull Rear-Dumps. They take rough treatment . . . give you continuous high production. Call or write us for complete details.

Tournapull—Trademark Reg. U.S. Pat. Off. CR-1195-Q-b

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

WHERE QUALITY IS A HABIT

For Economical, Efficient Concentration of Minerals

The SuperDuty® DIAGONAL-DECK® Concentrating Table attains unmatched economy and efficiency through the perfection of long-proved basic riffling arrangements. Even the shape of the deck, designed to conform to the natural path of material flow, eliminates "loafer" riffles. The result is exceptionally high grade concentrates, minimum loss to the tailings and a greatly reduced volume of middlings for recirculation; which, in turn, adds more tons of new feed per day to SuperDuty table capacity.

For full information, send for Bulletin 118-B.

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While unexcelled for feeding concentrating tables, the CONCENCO Revolving Feed Distributor effectively provides a splitting of feed into any desired number of equal portions, to accurately feed circuits or machines in battery for their greater overall efficiency. It is a heavily fabricated all steel machine with motor drive requiring 1 H.P. or less in operation.

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Freeport Gets Approval For Offshore Operation

THE FIRST completely offshore sulphur mining operation in the world has been approved by the U. S. Government. Freeport Sulphur Co., which has been seeking Federal approval for its plans to mine a dome under 45 ft of water off Grand Isle, La., will now go ahead with Frasch process procedure.

Rights to the deposit, held by Humble Oil and Refining Co., were assigned to Freeport last fall, with oil and gas rights withheld. A Freeport official noted that mining the large dome will involve building a large permanent structure in the Gulf.

Mufulira Expands Copper Output to 155,000 Tons

AN INCREASE in annual output from 100,000 long tons of copper to 155,000 long tons has been announced by Mufulira Copper Mines of Northern Rhodesia. Additional output, based on a new ore-body, is not due for five years.

Base of the $39-million expansion is the "Mufulira West" discovery.

Nicaragua Reports on "Promising" Minerals

NICARAGUAN Depart of Mines and Hydrocarbons has released a report by its Italian geologist which points up large and economically exploitable deposits of minerals in the country. The report states that the most promising are iron, copper, antimony, gypsum, marble and diatomaceous earth. Estimates of 30-million tons of iron ore (64% iron) and 10-million tons of gypsum are made.

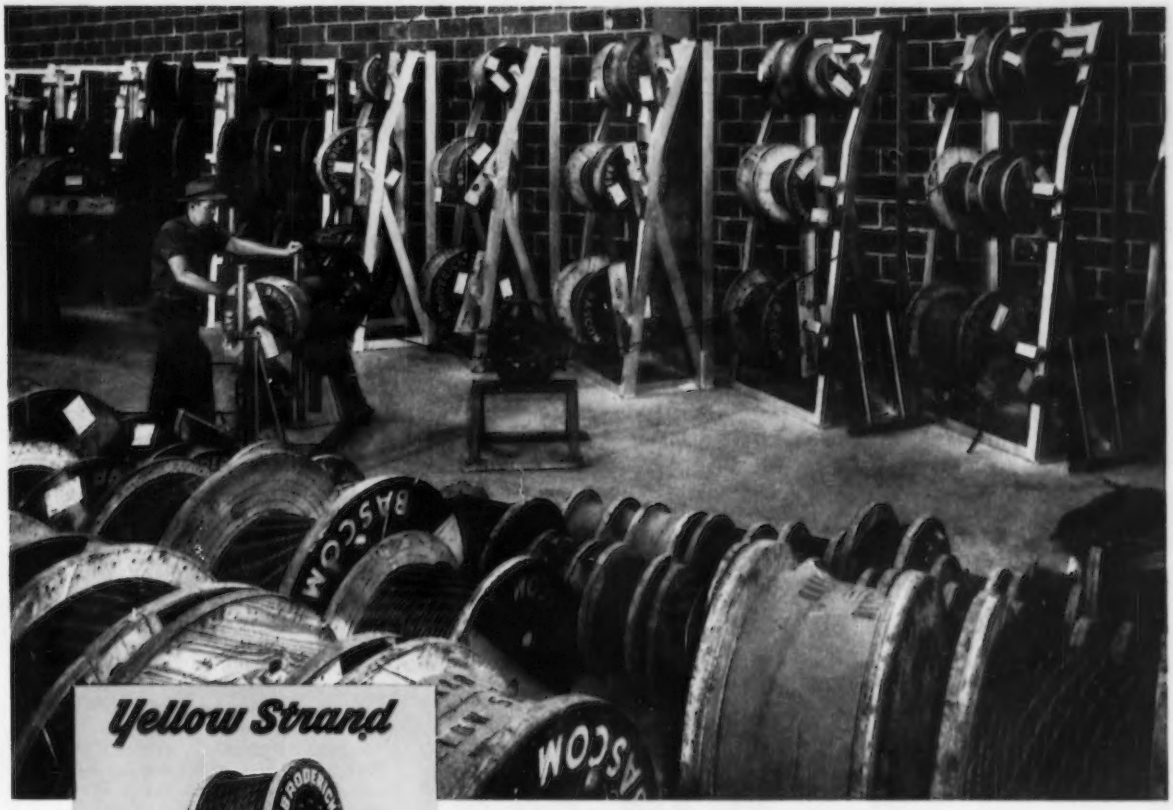
Interested companies have found, however, that no mining rights are being extended by the Nicaraguan government until such time as the National Congress approves a pending mining law which has been drawn up. Approval is expected this year.

Canadian Official Sees Huge Potash Operations

AN INDUSTRIAL BELT based on what is believed to be the world's most extensive potash deposits will stretch for 250 miles through the province of Saskatchewan in its new era of industrial development.

This prediction was made at the 50th annual meeting of the Canadian Gas Association during June in a paper presented by J. R. Sarsfield, sales manager of the Saskatchewan Power Corp.

"This province will have a phenomenal growth in the next decade," Sarsfield told delegates to the meeting staged at Jasper, Alberta. "Our potash resources are of interest to the natural gas industry. With one mine past the 2,000 ft level and with a second international company now commencing operations



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Load is carried where body is strongest. Specifically designed for coupling steels.
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V-R BOTTOMING BITS
. . . an original V-R development—the steel drives against the bottom of the bit body. See diagram. 19 sizes—1⅝" through 8". Thread types 200, 400, 600, 700 and 1000. "X" style available.
Exclusive V-R shock and abrasion resistant carbide.
Highest quality fatigue-resistant alloy steel body.
Precision machined threads. Fully heat treated.
V-R SHOULDER BITS
. . . 16 sizes—1⅝" through 4". Thread types F, H, D, K, 113, 115 and 121.
Exclusive V-R shock and abrasion resistant carbide.
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Special alloy steel body.
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. . . 9 sizes—1¼" through 2¼" for ⅞" through 1¼" steels. 6° taper Classes A, B and C and 12" long taper.

Wherever there is rock, V-R Bits are building a reputation for fast, low cost drilling. There are good reasons:

Exclusive Carbide Grades. Since 1930, Vascoloy-Ramet Corporation has been a recognized leader in the manufacture of cemented carbides for severe wear applications. The carbide in V-R Bits is a recent, exclusive development providing exceptional impact and abrasion resistance.

Precision-Set Blanks. V-R carbide inserts are perfectly positioned in the bit body, preventing irregular stresses that shorten bit life.

Heavy-Duty Precision-Ground Bodies. Exclusive design, special non-fatiguing alloy steel, controlled heat treating, accurate threads and precision grinding produce V-R quality products.

Use the bits that are beating them all—V-R Bits!

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Potash (*Continued*)

and with nearly all of the world's big potash producers coming in, there are 19 companies in all interested in the potash development in the province."

As an example of the extent of the reserves, Sarsfield quoted one potash official as stating that "Saskatchewan reserves are richer and more extensive than all other known potash deposits in the world put together."

He pointed out that the development represents a solid base for industrial chemical expansion in the province, adding:

"With one company at the northern part of the belt and the other 250 miles southeast, some idea of the extent of these deposits is realized. The deposit underlies the whole of the southern part of the province and the width of seam is the only factor determining the depth at which it can be economically mined."

Texas Group Leases In Twin Buttes Copper Area

THIRTY-TWO CLAIMS in the Twin Buttes of Arizona have been leased from Calizona Mining Co., Inc. Tucson, by a group of oil operators, according to W. E. Iseman, president of Calizona.

Leased property adjoins the Papago Indian Reservation, where AS&R recently was high bidder for mining rights. Iseman reports that the leasors have conducted geophysical surveying and cutting of trenches.

Researchers Announce Birth of Element 102

SYNTHESIS of the heaviest man-made element was announced in mid-July at the Argonne National Laboratory, according to the *New York Times*. Officially called element 102 (the scientists who achieved the synthesis have proposed the name nobelium after the Nobel Institute of Physics, Stockholm) the element is formed by bombarding the synthetic element curium with positively charged carbon ions, fired by a cyclotron.

No more than 30 or 40 atoms of the new element has been produced so far, scientists noted. It was noted that they possess a half-life of 10 to 20 minutes.

The discovery was made through combined efforts of the Nobel Institute, the British AEC research laboratory at Harwell, and the Argonne Laboratory.

Grace and Pechiney Form Silicon Producing Firm

PRODUCTION of high-purity elemental silicon and other semi-conductors will begin within the year by a new firm composed of the W. R. Grace Co., of New York and the French metallurgical and chemical company, Pechiney. The new facility, as yet unnamed, would produce an estimated 20,000 lb per year.

J. Peter Grace, president of the U. S. company, noted that the agreement also

B.F.Goodrich

How Eagle-Picher gets 2 to 3 retreads from B.F.Goodrich all-nylon tires

THE EAGLE-PICHER COMPANY mines and processes lead and zinc ore in northeastern Oklahoma. Inside the mine, dump trucks haul 9.5-ton loads, trailers haul 15-ton loads. Diesels used for outside hauling average 15¼ tons per load. Eagle-Picher used B.F.Goodrich *all-nylon* tires for all these jobs.

The B.F.Goodrich Rock Logger tires above and Universal tires (below left) work inside the mine on a bed of slippery flint rock, yet carry over 3,500 tons a month and give 18 months' service before retreading. Traction Express tires (below right) cover up to 4,000 miles a month on gravel roads. In spite of this rugged work, Eagle-Picher gets as many as 3 retreads from B.F.Goodrich tires!

The B.F.Goodrich *all-nylon* cord body is stronger than ordinary cord materials, withstands double the impact and resists heat blowouts and flex breaks. That's why the B.F.Goodrich *all-nylon* cord body outwears even the extra-thick tread, *can be retreaded over and over!* You get more hours of tire service at lower cost per hour.

Your B.F.Goodrich dealer has a tire for every kind of mining work. Ask him to show you the tires that will save you money or write: *B.F.Goodrich Tire Company, A Division of The B.F.Goodrich Company, Akron 18, Ohio.*

THESE UNIVERSAL tires carry 15-ton loads, often make over 250 trips a month on slippery, razor-sharp flint rock.

ALL-NYLON Traction Express tires work 48 hours a week hauling ore from Eagle-Picher mine. Company uses 3 types of BFG tires.

Specify B.F.Goodrich tires when ordering new equipment

B.F.Goodrich
FIRST IN RUBBER

Your B.F.Goodrich dealer is listed under Tires in the Yellow Pages of your phone book

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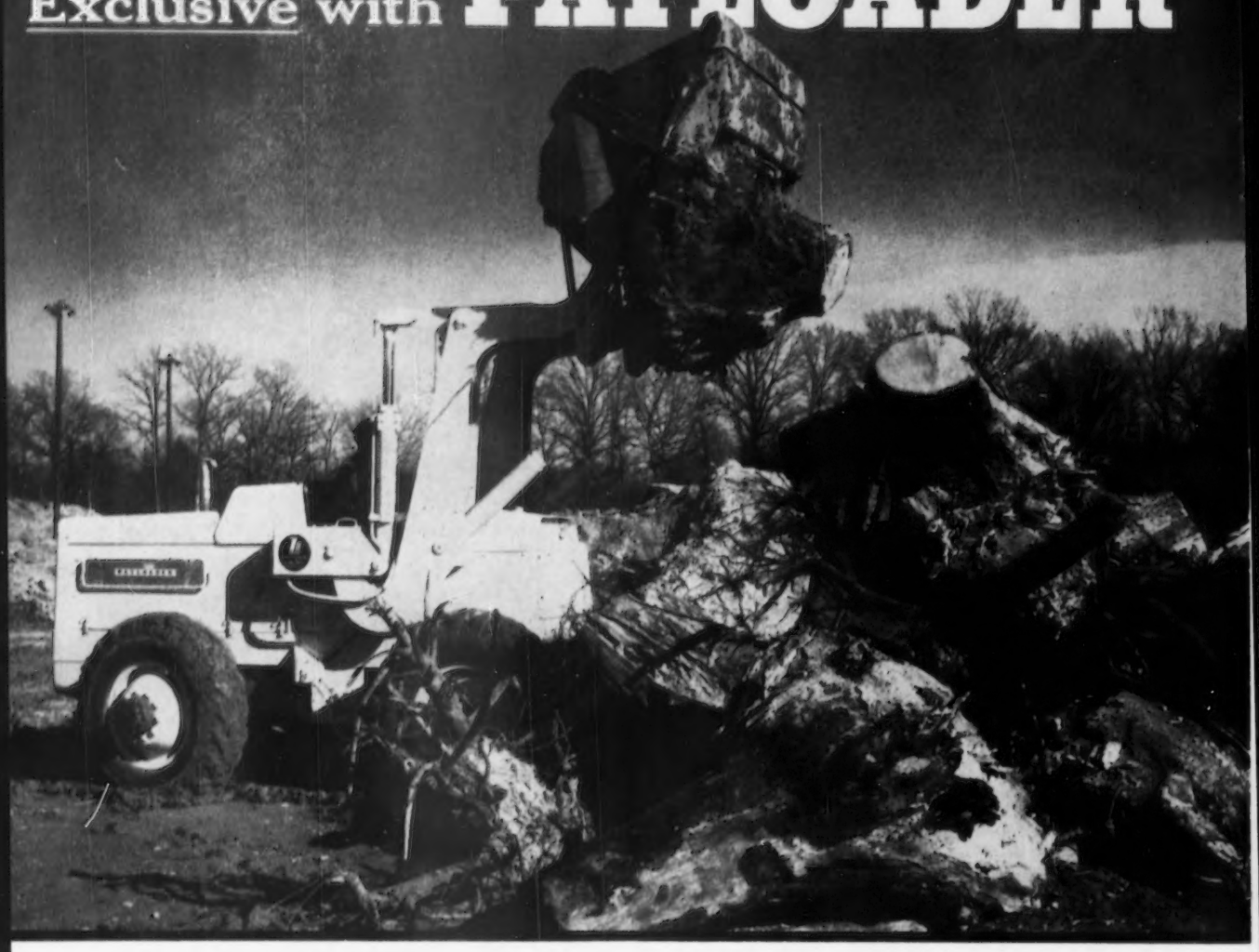


DROTT 4-in-1 buckets

Another valuable attachment has been added to those available exclusively for "PAYLOADER" tractor-shovels. This is the patented Drott 4-in-1 bucket which, coupled with the power and mobility of the current line of 4-wheel-drive "PAYLOADER" tractor-shovels, gives them greater performance on many jobs, and the ability to handle many operations that usually require special machines.

More than ever before, you get more tractor-shovel when you buy a "PAYLOADER", because you get more tractor-shovel performance and more versatility. They have power-transfer differentials — an exclusive "PAYLOADER" feature that maintains effective traction on mud, gravel, ice and snow. They have no-stop power-shift transmission and torque converters . . . planetary final drives . . . power steering and 4 wheel power brakes. They have the exclusive bucket motion with 40° tip-back and powerful pry-out action that enables them to dig more, carry more and deliver more . . . to outperform any comparable tractor-shovels. Your "PAYLOADER" Distributor is anxious to demonstrate what these "PAYLOADER" tractor-shovels and Drott 4-in-1 buckets can do for you.

SHOVEL

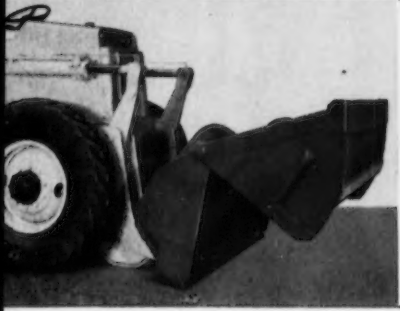
The four-in-one bucket can always be used as a regular tractor-shovel bucket to dig, carry and dump in the regular manner.

CLAMSHELL

Use the powerful clamshell action to clean up small piles, to pick up without tractor travel, to grasp and handle stumps, pipe and timbers fast.

SCRAPER

With slight clam lip opening you have a carry-all scraper that heap-loads itself, carries and spreads thin layers or dumps completely. Strips sod and grades with real accuracy.



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Open the clam lip full, and you have a sturdy bulldozer with hydraulic fingertip blade-pitch control to regulate dozing depth and to discharge sticky material.

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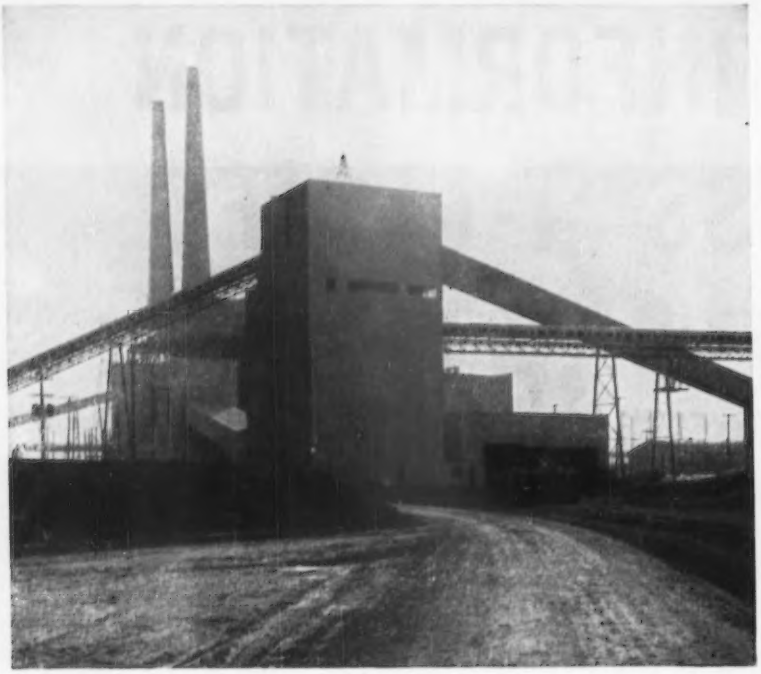


Moves a million-ton mountain of coal a year!

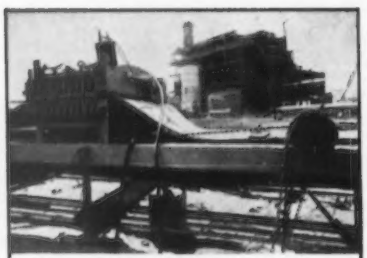
One of the largest in the U. S., this system depends on over 7,000 feet of Quaker Rubber belting to keep the coal moving.

PROBLEM: The Detroit Edison Company needed three separate conveyor systems to carry coal into their River Rouge power plant: (1) dock to storage, (2) dock to breakers to plant, (3) storage to breakers to plant.

SOLUTION: Quaker engineers and the Quaker distributor's men, working with engineers of the power plant, suggested the use of a belting designed for high lifts and long center distances. Over 7,000 feet was installed.

RESULT: The three conveyor systems work smoothly and efficiently, carrying coal into the plant at the rate of one million tons a year.

YOUR PROBLEM: Whatever your conveyor needs, whatever your industry—there's a Quaker Rubber Belt (or Hose) of the *right* construction to handle the job safely and economically. Quaker engineering service is available for the asking.



To make sure 7,000 feet of Quaker Rubber conveyor belting (available in 48", 60" and 72" widths) was properly installed, splicing and vulcanizing of the belting was supervised by a Quaker Rubber specialist.

For your free brochure on conveyor belting, write your nearby Quaker Rubber distributor, or:

H. K. Porter Company, Inc.,
Quaker Rubber Works,
Philadelphia 24, Pa., or
Pioneer Works, Pittsburg, Calif.

QUAKER RUBBER DIVISION

H. K. PORTER COMPANY, INC.

Silicon *(Continued)*

provides for the import of Pechiney silicon for sale through International Selling Corp. shortly.

Hydrometals Mines Copper

"SUBSTANTIAL DEPOSITS" of high grade copper are now being mined and shipped from Shannon, Ariz. holdings of Hydrometals Corp., according to Morris Blumberg chairman and president of the successor to Illinois Zinc Co. Blumberg made the announcement to stockholders in Chicago, also noting that his firm has plans to build a plant in Illinois for production of high purity copper powder by chemical process.

USGS Raises Estimate of Domestic Chromite Ores

REVISED ESTIMATES, based on studies since 1945 by the U. S. Geological Survey, now show U. S. reserves of chromite ore to be 3.5-million long tons, instead of the earlier estimated 2-million long tons.

USGS notes that much of the difference is in low grade, with the remainder resulting from projections of tabular deposits in the Stillwater Complex of Montana. Some 90% of domestic resources are said by the department to lie in the Complex and in the Oregon beach sands. USGS noted that U. S. demand exceeded 740,000 tons in 1956 and averaged 530,000 long tons over the past five years.

Copper Mill for B.C.

WESTERN COPPER MILLS, LTD. will construct an $8.5-million copper fabricating plant on Annacis Island, near Vancouver, B.C., with initial production scheduled for late 1958. Copper for the mill will come from eastern Canada and the Tacoma, Wash. smelter which processes copper output of British Columbia.

IN THE U. S.

ALASKA

Litigation which could change the entire pace of mining operations in Alaska has been under way in District court in Fairbanks. The lawsuit, filed by Suntrana Mining Co., Inc., versus Usibelli Coal Mine, Inc., and A. Ben Shallit, doing business as Cripple Creek Coal Co., involves demands for $80,000 damages and a restraining order which would prevent the two defendents from dumping overburden from hydraulic mining operations into the Healy River.

Top experts from outside Alaska were called in by both sides in the case, which the Bureau of Land Management land office manager in Fairbanks, Bob Jenks, says will probably be precedent-

Alaska (*Continued*)

setting. Photogrammetric analysis was involved as Suntrana sought to prove that overburden from the other two coal companies, both located upstream, is filling in the river near their operation, making them increasingly vulnerable to floods.

Gold miners are watching the case with alarm since hydraulic mining is used extensively and any ruling could affect them.

The way the season has been starting out, 1957 should be the best year in recent experience for exploration work by mining companies in Alaska, according to Phil R. Holdsworth, territorial commissioner of mines. While companies are not so numerous, the number is growing and the ones that are in the Territory are equipped with crews and gear and are doing real exploration work, rather than just looking around at an occasional prospect, Holdsworth said.

Alaska's largest gold producer, U. S. Smelting, Refining & Mining Co., will operate 11 dredges in its three major mining areas, Fairbanks, Nome and the Hogatza river region this summer. This will be the first season of dredging in the Hogatza. The dredge was moved into the area, some 60 miles west of Hughes and 70 miles north of Huslia, two years ago. Since then the company has been getting equipment set up for actual work. At Nome, three dredges will work this season for the first time since 1955. One of the dredges capsized that season, but was partially salvaged and put back into condition last summer. About 675 men will be working at the three USSR&M mining centers this season. The biggest number, about 450 men, are located in the Fairbanks area.

ARIZONA

Asbestos mines in Gila County, shut down for three months, have gone back into production following allotment of $2.5-million by the Government for stockpiling purposes. About 350 persons normally are employed in 10 asbestos mines in the area. The stockpiling order is effective through June 30, 1958.

A $55 million reduction in Arizona mine valuations may have a state-wide impact. State tax commission indicates an increase in the state property tax rate may be necessary to replace lost revenue.

Assessed valuation of Arizona mine properties for 1957-58 has been set at $249,691,789—a $55,633,817 reduction.

Falling copper prices were the reason given by the Arizona commission for granting the tax reductions. Copper fluctuating under 30c per 16 as compared with 46c a year ago was cited as influencing commission thinking.

Largest reduction was $12-million on Phelps Dodge Corp. Morenci Branch. Valuation was cut from $85- to $73-million.

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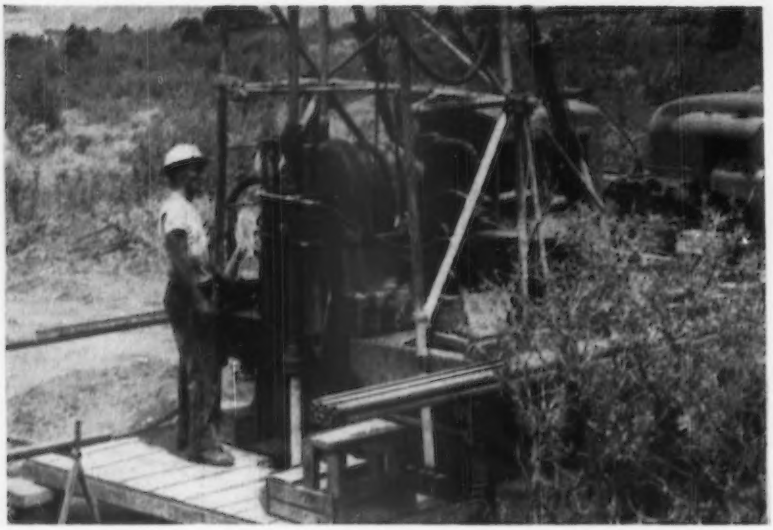

One of the many drill rigs now in operation throughout the United States and overseas.

The most important primary phase of construction, roadbuilding or mining begins with foundation investigation or exploratory work from which it is desired to get complete information and best possible cores. In many instances, contractors make the mistake of bidding on work or taking a contract without complete knowledge of sub-surface conditions, or miners will start mining operations without first conducting a thorough exploration program, but successful contractors and mining men always investigate first to know how to quote in order to get the contract and still make a profit, and how to plan to have a successful operation. One of the most reliable organizations in America for furnishing this information and satisfactory cores is Sprague & Henwood, Inc. For more than seventy years it has been rendering satisfactory core drilling service throughout the United States and the world. Many of its customers have continuing contracts with Sprague & Henwood, Inc., because they know that they can be assured of the best in foundation investigation and core drilling service that can be found anywhere.

Sprague & Henwood, Inc., with its own manufactured field tested drilling equipment; its own manufactured "Oriented" diamond bits; its highly trained personnel; and its well trained and highly qualified supervision assure you of the best possible results obtainable.

Write to Sprague & Henwood, Inc., today for any information relative to test borings or core borings you desire, or for an estimate, giving complete information, and it will be on its way to you just as quickly as possible, without obligation to you.

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Arizona *(Continued)*

The total PD reduction on all claims in the state was $34-million. Last year total assessed valuation of Arizona mining properties was $305,325,616

The state property tax rate of $1.25 per $100 assessed valuation could go up about 5.5c unless some other source of taxable wealth is found to make up for the loss on mines said Commissioner W. E. Stanford.

Other large mine reductions in the state are:

Copper Queen (Phelps Dodge) $5-million; New Cornelia (PD) $10-million; Lavender Pit (PD) $7-million; Magma Copper Co., $2-million; San Manuel (Magma) $10-million, Bagdad Copper Corp, $1-million.

Coronado Copper and Zinc Mine at Johnson, Cochise County, has closed because of falling metal prices. A historic town of the 1880s, Johnson faded to a work force of 135 men at the Coronado which operated as a subsidiary of Cyprus Mines Corp of Los Angeles. Mine Manager Fred Gray said the mine will be kept on standby with three men employed to pump shafts.

CALIFORNIA

Yuba Consolidated Gold Fields, veteran San Francisco gold dredging firm, will merge with its subsidiaries into a new $15-million company to be known as Yuba Consolidated Industries, Inc.

The move is designed to advance Yuba's diversification aims, the company said: it will pool the capital of the parent and subsidiaries, making more money available for expansion and diversification.

The new Yuba firm will continue to operate from headquarters in San Francisco under the leadership of president John McGara, who headed Yuba Consolidated Gold Fields and its subsidiaries, Portuguese-American Tin Co. and Yuba Industries, Inc. The latter, whose Yuba Manufacturing Division is a noted dredge designer and builder, recently diversified into the steel fabrication field through acquisition of several firms.

Kern Uranium Co. is stockpiling ore at its Kern River Canyon mine, pending decisions to be made about ore handling and transportation, Lloyd Scouler, president, reports.

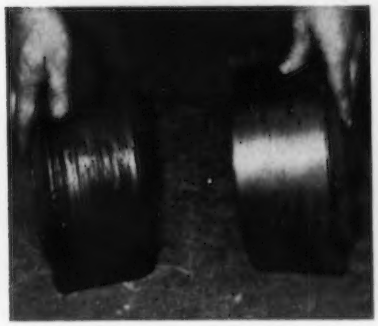
The company sank an offset vertical shaft in the footwall of their mine to a depth of 59 ft, cross-cut back into the productive structure more than 32 ft and is now drifting both ways on the vein. As of late June the company had shot and mucked a total of 30 ft of drift, producing about 20 tons of development ore, Scouler reports.

The first production chemical assay showed .82% U_3O_8, and an in-place sample of 6 to 8-in. blackish ore from the vein assayed chemically at 2.86% U_3O_8, it is reported. Mineralogical determination is not yet available on samples from zones the operator calls of obviously higher value. Identification of the minerals present is substantially

HOUSE ROLLS are automatically built up with 2 or 3 passes of Stoody 104.

How one of the country's large contracting firms MAINTAINS SHOVEL PARTS

The shovel parts illustrated here are typical of those regularly rebuilt and hard-faced by George M. Brewster and Son, Inc., famous for the big jobs handled, such as the New Jersey Turnpike and approaches to the George Washington Bridge. Standard maintenance practice includes complete restoration of worn house rolls, buckets, bucket teeth, pads and tumblers.



After rebuilding, the Stoody 104 deposit is machined to original size. This is one of the few parts requiring machine work. Others go into service "as-welded."

In the Brewster operation Stoody Hard-Facing Alloys are used for both manual and automatic applications. They help to keep equipment in service longer between repair periods and reduce the number of replacement parts that must be stocked. Life of rebuilt parts is invariably equal to or greater than the original equipment—yet the cost of rebuilding and hard-facing is but a fraction of new part costs.

Procedures followed here and by other major earth-moving contractors are described in detail in the Stoody Hard-Facing Guidebook and other Stoody literature; consult your Stoody dealer (see the "Yellow Pages" of your phone book) or write direct for full information.

WORN SHOVEL PADS. Conventional treatment includes rebuilding worn areas with Stoody Manganese and manually hard-facing with Stoody 1027.

OTHER SHOVEL HARD-FACING APPLICATIONS

Besides the applications shown, Stoody Hard-Facing Alloys are regularly used all over the nation for rebuilding and protecting Shovel Idlers, Drive Tumblers, Boom Heels, Latch Bars, Latch Plates, Buckets and Bucket Teeth. Wherever there's wear, you'll find effective prevention with STOODY ALLOYS!

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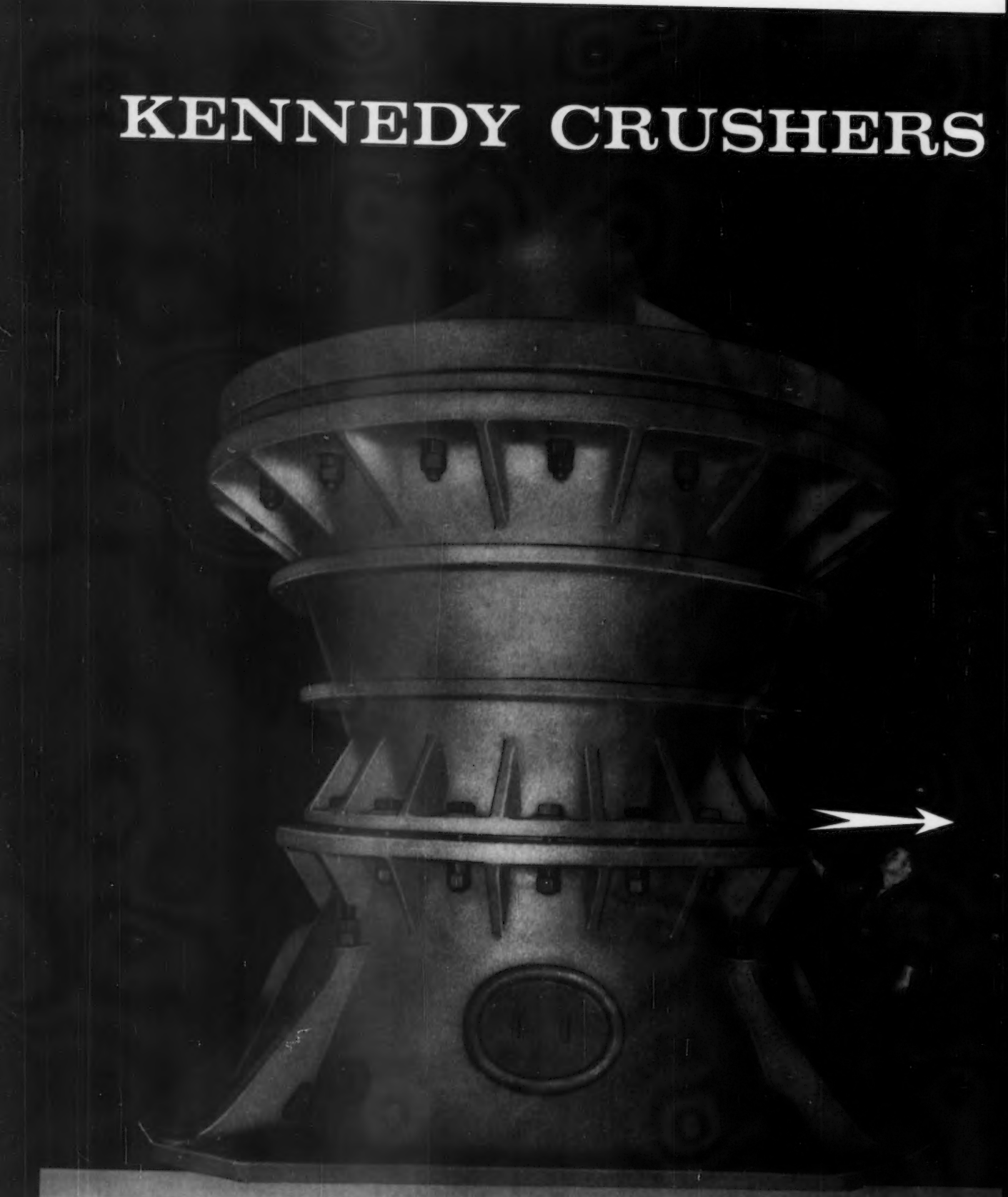
Whittier, California

KENNEDY CRUSHERS



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chosen for Heavy Duty Service at the plant of Lake Ontario Portland Cement Co. Picton, Ont., Canada

The new 5000 bbl. per day dry process cement plant of the Lake Ontario Portland Cement Co., combined with a modern 6000 ton per day aggregate plant, requires heavy duty primary crushing equipment to handle hard-to-crush rock.

The Kennedy No. 48 Gearless Gyratory Crusher is designed to handle large sizes of quarry rock regardless of hardness. Chosen by Lake Ontario Portland Cement Company as being best suited to meet the requirements of the combined operation.

In addition to 48 inch primary crusher Kennedy Gyratory secondary and tertiary crushers and impact crushers are installed in this modern plant.

Let K V S engineer help *you* select crushing equipment to meet any specific condition. Consultation, at any time.

Features which distinguish the KVS No. 48 Gyratory Crusher

- Primary Crusher
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- Gearless . . . Gyratory Type
- Synchronous Motor built directly into crusher pulley
- Power used only for crushing—no transmission loss
- All moving parts carried on roller bearings
- Produces peak capacities with minimum maintenance and operating cost

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Oliver Iron "Opens" New Mine; Starts New Ore-Sizing Plant

THE LARGEST INACTIVE RESERVE of iron ore held by Oliver Iron Mining Division (U.S. Steel) has been opened at Aurora, Minn. after 52 years. While division officers admit that it is not in the strictest sense an "opening of a new mine" (the property was worked from 1903 to 1905) the first carload bore the traditional pine tree.

The Stephens mine shipped 454,819 tons in its earlier history but still has an estimated 47-million tons of direct shipping ore underground. Oliver installed shipping pockets, a truck pocket and a crushing and screening plant, conveying equipment, maintenance facilities, power distribution system and a water supply and sewage system. Eleven miles of railroad siding and track also had to be laid by the Duluth, Missabe and Iron Range Railway.

Oliver plans 1957 output at 2.6-million tons and 3.5-million next year. Ore will be trucked to the crushing plant, the latter constructed by American Bridge Division. Plus 6-in. ore from the screens will be taken down by a 48x60-in. jaw crusher.

FOREMAN John Prelesnik, biller sampler Anthony Colangelo and car rider August Shuster do the honors for the first car out of the Stephens mine.

Virginia Sizing Plant

A 33,000 tpd capacity ore sizing plant at Virginia, Minn. went into operation in mid-July under Oliver Iron Mining direction. The new addition adjoins the Rouchleau crushing plant and will treat ores from the eight Rouchleau mines. New plant is designed, officials say, primarily to improve the quality of the ore processed by improving the structure. A similar installation at Chisholm is due in the fall.

Virginia plant consists of eight screening units, each containing a surge bin, pan feeder and two 6x12-ft screens in tandem. Twenty conveyor belts (48-in.) transport ore at 300 fpm. New plant takes 4-in. ore from the Rouchleau plant and separates it to minus ½-in. and plus ½-in. Fines must be sintered before blast furnace use.

An estimated 50,000 to 75,000 tons of low grade ore at the mine assay at between $20 and $60 per ton, it is reported.

Surcease Mining Co has initiated shutdown of its tungsten operations at Atolia, San Bernardino County. Recent production has been entirely under lock leasing system. It was terminated as of July 9 although cleanup millings and shutdown arrangements will require several weeks. Shutdown will be complete and for indefinite period.

This action results from congressional refusal of appropriations to continue carrying out the Industrial Reserve Stockpile Program set up under Public Law 733 last year. Lack of action to date by Congress, with full appreciation of Senate majority and House minority support, in honoring its commitment under the Program has already had ominous direct effects on the industry.

California *(Continued)*

a matter of opinion, Scouler adds.

He says, "We have a well defined fracture, with a good hanging wall. It is fairly reasonable to assume that the vein we are drifting on at depth is the same one that outcrops at the surface, although good mining practice prohibits a positive statement to this effect at this stage. The mineralization at depth is very encouraging but we are going to have to look at more of it before we can begin to estimate our economic position."

Mac Rizzardini and Bill Wilkerson are working Wilkerson's claims adjoining the Sunshine Mine in the Stringer District of Randsburg. They report finding gold-bearing quartz in a 6-in. by 5-ft vein at a depth of 15 ft.

A bentonite processing and sacking plant 5 miles east of Panamint Springs is planned for construction in the near future, John S. Stohr, co-owner with Lawson H. Linde, announces. Both men are of Bakersfield.

The plant site is at placer claims totaling 4,120 acres. The $50,000 plant will be used to sack bentonite from a reserve estimated by operators at 650-million tons. The deposit is reported to be the largest left on the West Coast. Tests currently being run by the Brown Mud Co. of Bakersfield indicate that the bentonite available mixes well with salt water, Stohr says. That factor will make the bentonite exceptionally valuable for certain types of drilling operations, he adds.

Gold ore is being stockpiled at the old Cecil R mine 4½ miles south of Ballarat in the Panamint Mountains near Death Valley.

Owners John Polson of Mojave and Jim Carter, Moab, Utah, plan to build a mill near the mine to handle low-grade ore.

High-grade ore reportedly occurs in quartz stringers running almost horizontally through a quartz schist. An assay on the stringer ore runs from 7 oz to 85 oz per ton. Assay was done by Martin Engel of Cantil, mine owners report.

High-grade stringers run from ½-in. to 1½ ft thick. The surface ore is almost entirely free milling with the ore turning into gold-bearing galena and chalcopyrite at depth.

A 150-ft shaft connects with a 200-ft drift at the 100-ft level. There is a 150-ft cross-cut off the drift at the 100-ft level.

COLORADO

Bids were few and low on the half-million pounds of vanadium pentoxide offered for sale by the AEC at its Grand Junction Operations Office July 5.

Only two bids were submitted—one by Phillips Bros. Ore Co., New York, offering $249,538 for 464,922 lb, or about 52c per lb; and the other by Naftone of New York for Farbenfabriken Bayer A.G., West Germany, bidding $184,979 for 237,152 lb or about 78c.

Although AEC took the bids under study, observers predicted both would be rejected since AEC had stated previously it "does not intend to sell any vanadium at a price which does not bear a reasonable relationship to the present market price." Market price in Grand Junction was estimated at around $1.22.

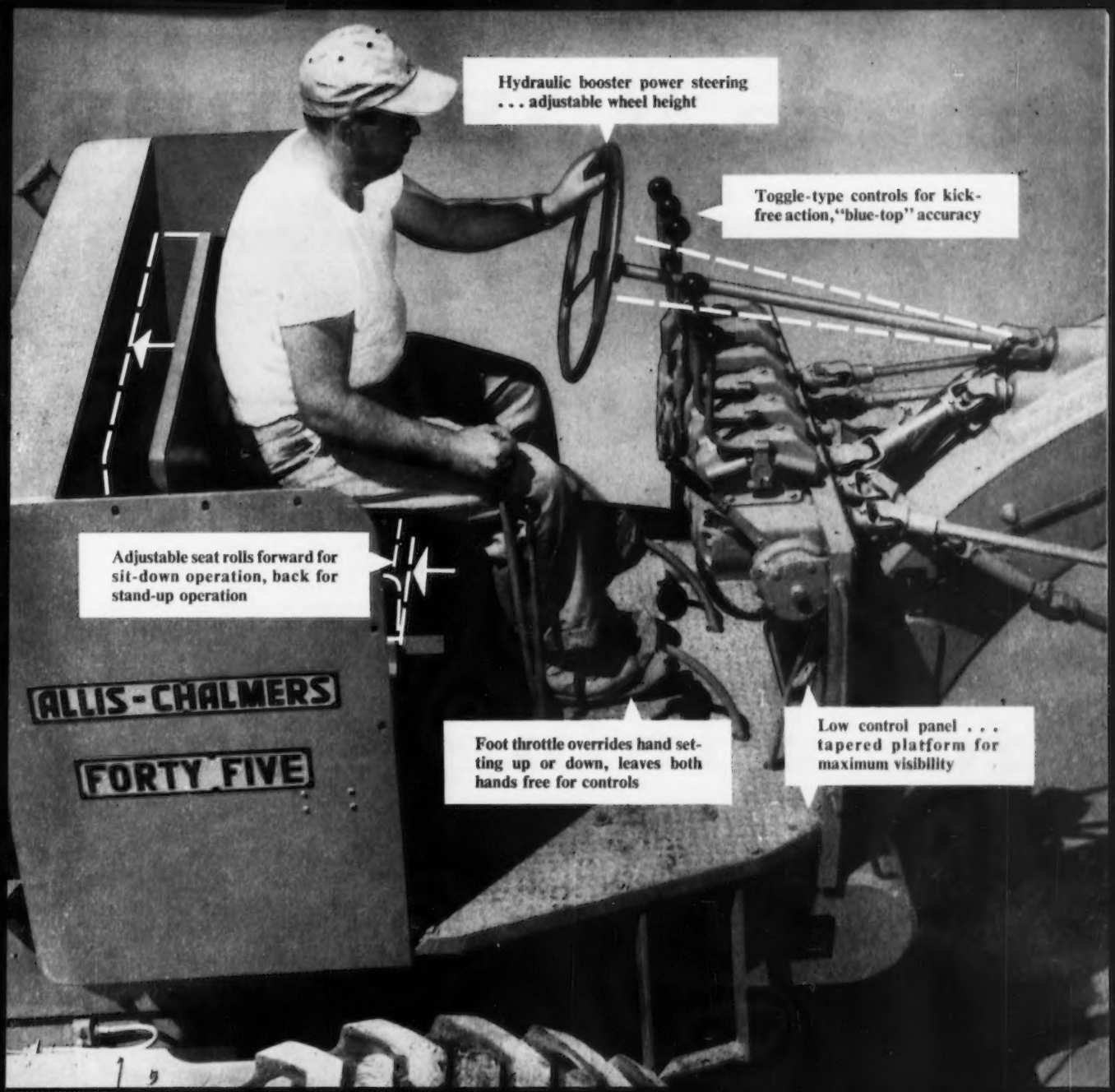
Union Carbide Nuclear Co. had two observers at the bid opening. AEC said three firms submitted letters but no bids.

AEC has about 4.5-million lb of vanadium pentoxide on hand, purchased as a by-product of uranium milling.

Juniper Oil and Mining Co., Denver, informed stockholders in June one of its orebodies in the Tallahassee Creek area near Canon City has been subleased to Cotter Corp. of Santa Fe, N. M. Juniper has retained an override on production from the 27,000-ton ore body and will continue to operate other properties in that area.

Cotter Corp. holds a contract with AEC for delivery of concentrate from a pilot plant uranium mill to be built at Canon City.

Extensive development in the Wet Mountain area, a short distance south from Canon City resulted in the production of thorium and other metals, and promises in a joint operation by Trabella Uranium Mines and Trans Mountain Uranium Mines, soon to be started, accirding to Standley P. Balcomb, president of Trans-Mountain. Balcomb states that the two companies have agreed to obtain and produce from 39 thorium and rare earth claims, approximating 780 acres in the Wet Mountain Valley area.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Foot throttle overrides hand setting up or down, leaves both hands free for controls
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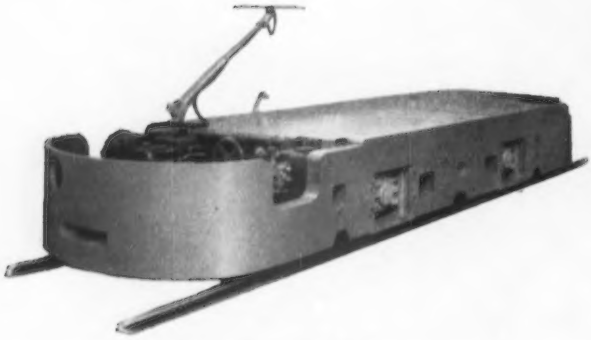
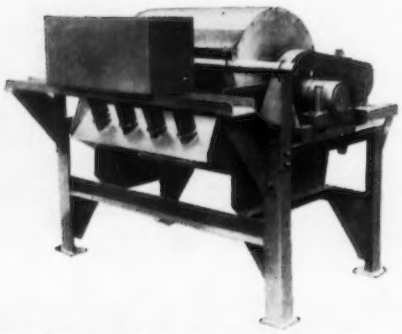
To meet all capacity requirements and for handling most classes of materials. Jeffrey feeders can be furnished with various styles of decks and in types to satisfy all operating conditions; dust-tight, spark-proof, etc.

for mining.....



Locomotives

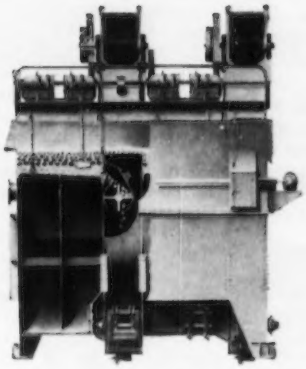
Sturdy, streamlined, easy to operate and maintain, Jeffrey locomotives are known throughout the world for their reliability and long-term service. Available in trolley, cable reel and storage battery types, in sizes to suit your requirements.



Magnetic Separators

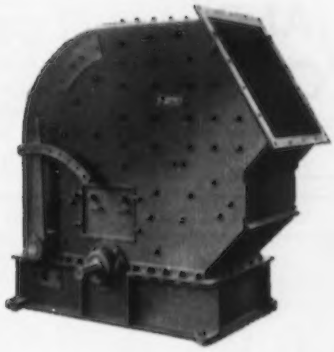
Solve wet concentration and magnetic recovery problems. Of the wet drum type, with only this one moving part, Jeffrey separators and cobbers are simple to operate. One supervisor can take care of a 70-unit plant. They're highly efficient.

and processing.....



Baum Jigs

Ideal as a final concentrator or as a rougher ahead of flotation. Jeffrey air-operated jigs give exceptionally high capacity per unit of area, often ten times that of conventional plunger jigs. For years they've been handling some of the toughest separation jobs.



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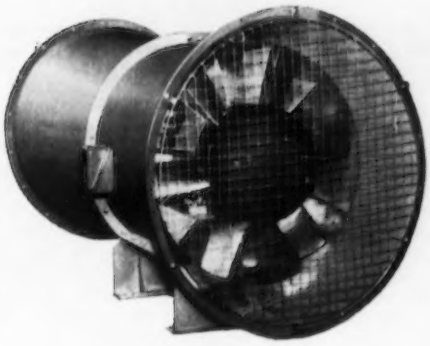
A hard-hitting giant that's suitable for crushing large primary feed—everything that comes from the face, without preliminary sizing or picking. Also available from Jeffrey are other crushers in types and sizes to meet every sizing requirement.



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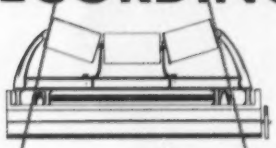

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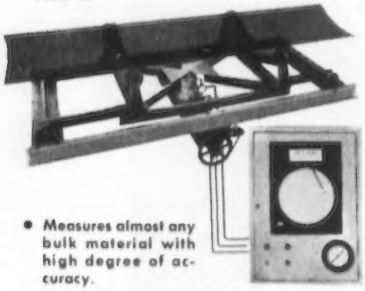

- Measures almost any bulk material with high degree of accuracy.
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Colorado (*Continued*)

A new smelter has been constructed about two miles northwest of Saguache to handle ores from the Saguache and nearby Chaffee, Gunnison and Fremont county areas. The plant has been constructed by the Saguache Smelting Co. of which William Dickerson of Saguache is president.

Jack C. Turner, president of Red Hill Uranium has announced from his office in Salt Lake City that his company has just completed negotiations for the lease and mining of 31 unpatented mining claims located in Bull Canyon, Colorado.

Claims, known as the Patty-Sunrise Group, have been producing uranium ore for several years and are in production at the present time. Both private capital and the U. S. Government have spent money for core drilling and other exploration programs on these claims, resulting, says Turner, in a large tonnage of uranium and vanadium ore.

Cadwell Mining Co. reports that it has broken through in a raise at its property on Fryer-Carbonate Hill in Leadville, and will begin shipping ore to milling facilities. Work has indicated a face of ore at least 5x7 ft on a bedded deposit, says the company. Previous assays on this same deposit have shown values of ore that range better than $100 per ton in the raw state. Ore contains lead and silver predominantly with other values.

Cadwell Mining Company has been mining through the winter on this lead-zinc-silver property and has reached a production rate of from 50 to 75 tons of ore per week. Raw ore assays ran as high as $200 plus per ton.

Pikes Peak Uranium Corp. of Colorado Springs, operating in San Miguel County, has leased 60 claims from Sutton, Enoch and Associates, it was announced by E. J. Brittain, secretary. Brittain said the claims, each covering 19 acres, were obtained on a royalty and purchase agreement.

Company, operating about 68 miles from Cortez and 33 miles from Dove Creek, in southwest Colorado, has completed a 485-ft tunnel and the first load of uranium ore has been shipped to the Climax Uranium Co. mill at Grand Junction. Brittain said assays have shown as much as 12% vanadium.

Rocky Mountain Standard, Inc. of Boulder, has announced that a 300-tpd uranium ore upgrading plant will be constructed northwest of Ft. Collins. The mill will use a patented process of Rocky Mountain Standard Tests of ore from this deposit which have been beneficiated to near 1.0% uranium oxide and shipping volume cut 90% for mill delivery.

Lisbon Valley Uranium Co. of Denver reports operations during 1957 includes: Acquisition of the Red Elephant Mines at Lawson. Three months development work by split-check operators at the Red Elephant mines has opened up two veins of silver-lead-zinc ore which at the present time represents gross values up to $57 per ton in the Girt vein.

Company has reopened its Chautauqua mine at Montezuma. Split-check operators in three months have developed a good vein of silver-lead ore and are now reactivating company's concentrating mill near the mine. During development approximately 350 tons of crude ore, having an average gross value of from $20 to $56 per ton, were shipped to the smelter. Operators anticipated sufficient production to run the company's 40 tpd mill one or two eight hour shifts per day.

Warren Oil and Uranium Mining Co. has purchased two producing uranium mines. "These mines," according to T. R. Llewellyn, vice-president, in a letter to the stockholders, "gives the company over 60,000 tons of carnotite ore, blocked out with an estimated income of $42,000 per month. Company also purchased Neptune Uranium Company's Shamrock Mine in the Red Canyon, Uravan area. In addition, to two tunnel operations now on the property from which Neptune had been delivering carnotite ore, an ore body of about 4,000 tons was blocked out by a DMEA drilling program.

IDAHO

Renewed interest in uranium prospecting in the Stanley Basin may result from ore discoveries reported by two firms.

Bell Cross Mining Co. after two years of prospecting has discovered a 3 ft fissure type deposit of uranium of unannounced value.

Western Favorite Mining Co. and Arkansas Corp. report stockpiling of 500 tons of ore which will be shipped to mill at Salt Lake City when road conditions permit.

Hall Mountain Thorite Mining Co. has increased its holdings on Hall Mountain in the vicinity if Porthill, Bruce R. Berringer, president and manager of the firm, said.

He reported leasing of five adjoining claims which tie in with the thorium-bearing vein which his firm has been opening by a tunnel. The leased claims extend up the mountain from his present claims to the Canadian border at the summit.

Hecla Mining Company officials said that tunneling work at the bottom of the 2,000 ft Silver Mountain shaft near Mullan, has reached the Paymaster fault, initial objective at the project. An extensive stringer zone was found on both sides of the fault and it contained some sulphide mineralization.

Tunnels are being started along the fault structure in both directions, officials said. They will be driven for about 3000 ft in each direction. Diamond drilling will probe for ore bodies. Hecla said the work will proceed on a three-shift, round the clock basis.

Stockholders of six Kellogg mining companies have approved a proposal for consolidation of their properties in the west end of the Silver Belt east of Kel-

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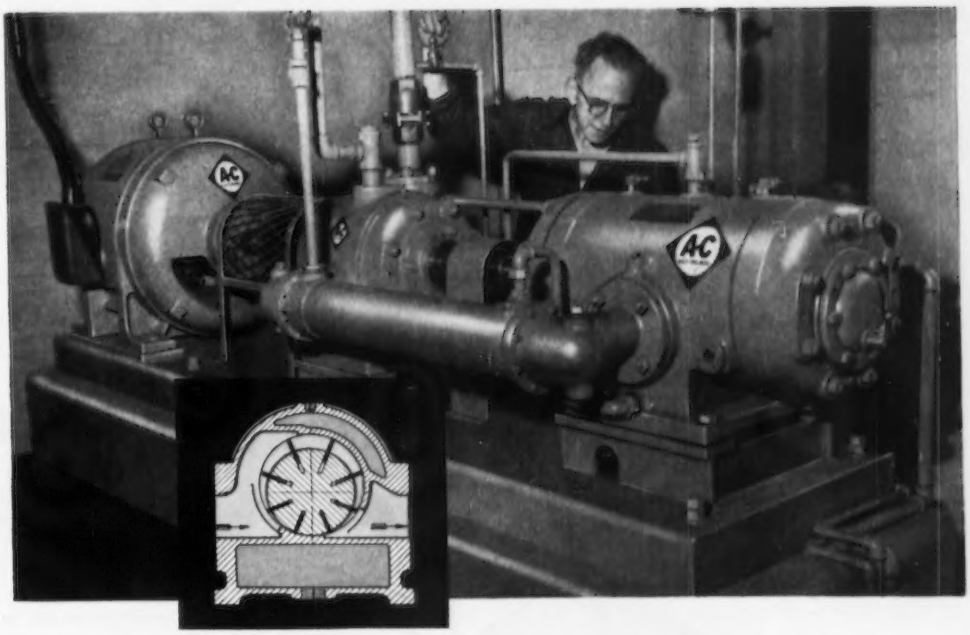

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Compactness — No extra weight or size needed to dampen vibration.

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A-5354

Idaho *(Continued)*

logg with the objective of concluding an operating agreement with the Bunker Hill Co. for deep development of the consolidated group from the below-sea-level tunnel which Bunker Hill is driving to connect the 3200 level of its Crescent Mine on Big Creek with underground workings of the Bunker Hill Mine south of Kellogg. The six companies are Altura Mining Co., Hill Mining & Milling Co., Mohawk Silver-Lead Corp., Paramount Mines Corp., Yreka Mining Co. and Yreka Mines Inc. A total of 49 mining claims are involved in the consolidation and Yreka Mines Inc. will be the surviving company. Stock conversion ratios under the merger deal will be: one Yreka United share for each two Yreka Mining or Hill Mining held; one for each three Altura and Paramount; and one for each five Mohawk.

The new vein opened early last May by Day Mines Inc. on the 500-ft level of its Dayrock Mine north of Wallace has been exposed for a length of about 132 ft and shows an average of 20% lead and 5 oz of silver over a width of 5 ft. Company officials have designated it the "Bonanza" vein and term it the "most encouraging development at the Dayrock in many years." New structure, disclosed initially by diamond drilling, lies north and west of the Ohio vein which has been the mine's principal source of production for several years.

Three exploration headings are now in progress on a three-shift basis on the 2,000-ft. level of the Silver Mountain property in the Coeur d'Alene District east of Mullan. The main north crosscut from the new shaft, now out more than 1500 ft, has passed through the Paymaster fault zone and is being continued toward the Snowstorm area. At the 1100-ft point easterly and westerly drifts have been started in the footwall of the Paymaster zone. Hecla Mining Co. is operating company on the project, which is a joint venture with the Bunker Hill Co., under an operating agreement with Silver Mountain Lead Mines.

Pinnacle Exploration Inc. of New York, exploration subsidiary of Callahan Zinc-Lead Co. and Vulcan Silver-Lead Mines Inc., has started preliminary diamond drilling work on the vast holdings of Uranium Mines Inc. adjoining the Silver Mountain property east of Mullan. The initial drilling contract calls for two 1,000-ft test holes on two major "structural zones" on the property.

Low metal prices and mounting operating costs have forced Nabob Silver-Lead Mines Co. to close down its zinc-lead mine in the Pine Creek area of the Coeur d'Alene District. The shutdown leaves Sidney Mining Co. as the only remaining producer in an area where several mines were in steady production a few years ago.

The decision came at a time when Nabob's outlook appeared more favorable than it has in some time. Recent operations have been concentrated on development of the new 1450 level of the D-5 vein, and a substantial lead-zinc ore body has been opened and prepared for stoping. Directors, however, decided against "giving away" the metal at present prices.

Mine production from the Coeur d'Alene District during 1956 totaled 1,468,075 tons with a gross value of $40,091,777, according to reports from 23 mining and 9 leasing operations filed with the Shoshone County Assessor. This compares with a 1955 output of 1,406,432 tons worth $38,436,531 and represents a slight recovery after four years of declining production.

Top producer in the district by a wide margin was Bunker Hill Co., which accounted for nearly half of the total tonnage and more than half of the gross value. Its Bunker Hill and Star Mines produced a total of 722,983 tons of ore with a metal content valued at approximately $20.6-million.

American Smelting and Refining Co., which operates the Page, Morning, Frisco and Galena mines in the district, ranked second in production with a combined output of 291,362 tons with a gross value of $8,400,602. Third largest producer was Sunshine Mining Co. with a total of 200,028 tons, including tonnages mined for and credited to Polaris, Silver

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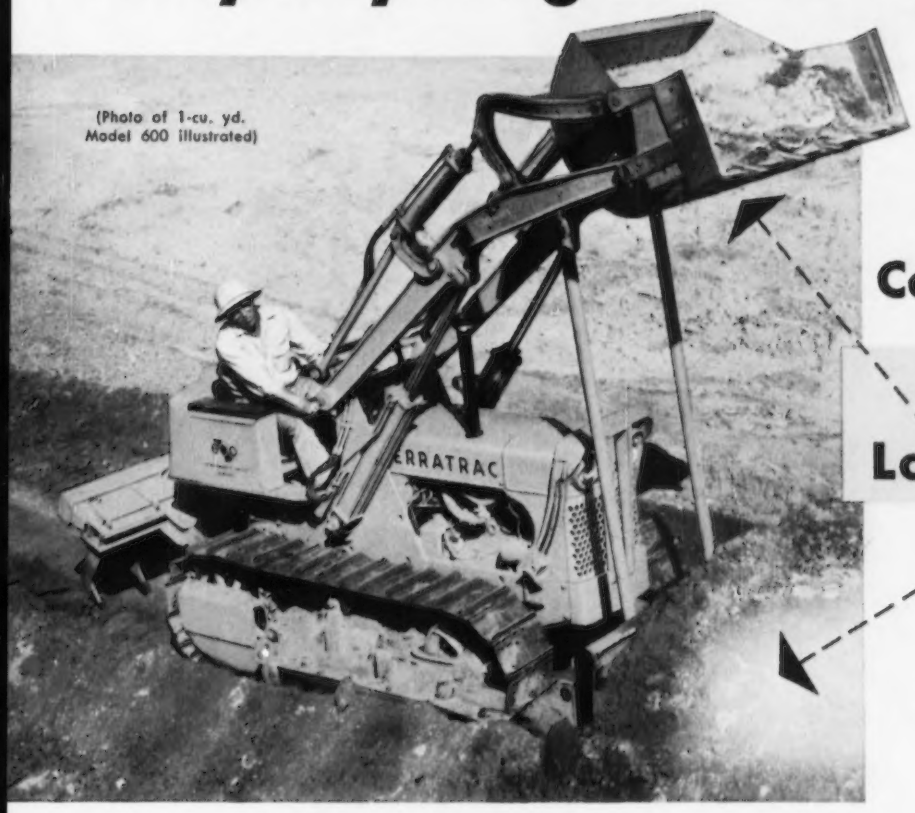

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Attaching shielding ground wires to grounded messenger, workman completes joint in Anaconda 250 Mcm, 15,000 volt, grounded neutral, butyl-insulated, shielded, neoprene-jacketed cable in underground western mine.

What's this--Anaconda Aerial Cable underground?

Although the use of aerial cable underground sounds slightly incongruous, more and more mines are finding that it makes good sense. Good dollars and cents, too.

Cable is out of the way of damage by equipment, is easier to move, better for re-use. And there's no ditch to dig or fill. Simple installation, easy jointing and tapping reduce time and labor.

But there's more. Butyl insulation gives Anaconda mine power cable (aerial or otherwise) long-aging characteristics, improved resistance to moisture, ozone and heat. Neoprene jacket is rugged, tough – has real flexibility, resists rock cutting, impact, flame, sun and corrosive mine water.

Your Anaconda distributor has the facts and can help you choose the cable best suited to your needs. Call today! Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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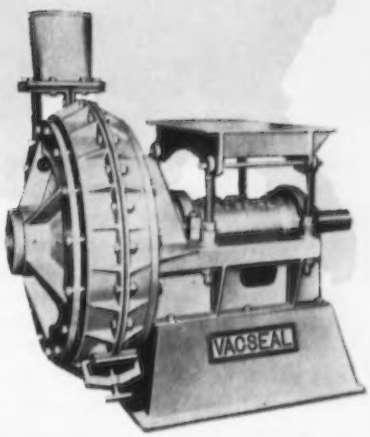
for MINE POWER CABLE

URANIUM discovers VACSEAL

At nearly every important proposed or operating Uranium mill, VACSEAL Pumps are on the job. The map below shows some of the far flung locations where VACSEAL is performing a variety of pumping operations, including the especially tough assignment that requires handling of slurries and acid solutions. Whether corrosive or abrasive materials—these sturdy, trouble-free pumps perform smoothly and without dilution.

VACSEAL'S unique no-sealing-water feature is paying off for Uranium mills everywhere.



From 1 to 120 VACSEAL Pumps of various sizes are used at most of these mills. In addition to VACSEAL Pumps many of these mills are using other Galigher products, such as: agitators, Geary-Jennings Samplers, Galigher Sump Pumps, and Galigher corrosion and abrasion resistant coverings and lining.

Leaders in Experience and Service

VP-514

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THE ORE-MASTER UNDERGROUND DUMP TRUCK

SPECIALLY DESIGNED FOR LOW HEAD ROOM and NARROW DRIFT AREAS

This rubber-tired, rugged, heavy duty unit has proved a valuable aid to higher production and lower underground haulage costs. It helps get that extra load or two per working shift for each truck through fast dumping and fast body return to down position.

Some of the service features are: This unit operates with lower maintenance costs than any other ore-hauling device now being used. It will perform in 8′ x 8′ drifts and have room to spare. It can carry 12,000 pounds of pay load quickly and efficiently. This unit with three speeds in either direction enables the heading to be worked without turning the truck around.

WRITE FOR COMPLETE DETAILS

• SPECIFICATIONS

Description—

Engine: GM Diesel Engine, Model 2055C (2-71)—or Model 43300 (4-51)
Other engines available on special order.

Transmission: Allison—CRT 3330-3
Lubrication; Type—Full Pressure Capacity—7.5 gal.

Torque Converters: Allison—TC 320 Single Polyphase
3.50—1 Ratio 4-Element
Built-in braking features with Drive line parking brake with brake lock.

Clutch: Multiple Disc Type; sintered bronze—steel core Hydraulic actuated—automatic wear compensation

Brakes: Bendix-Westinghouse-Air—rear only

Cooling System: 12 quart capacity—Harrison fin and tube type construction

Steering Gear: Worm and Gear

Tires: Nylon Rock Grip Excavator 7.50 x 15—12 ply

Springs: (front and rear) Heavy duty built up with extra leafs. Semi-Elliptic Type; Mounting—Shackle—both ends

Fuel Tank: 17 gallon capacity

*

Dimensions:

Wheel base		123″
Turning Diameter	right 50′	
Area to turn—180°-40′x40′	left 47′	
Over-all length	18′	0″
Over-all width	6′	6″
Over-all height	5′	6½″
Loading height (top of body from ground)	4′	6″
Wheels and body removed:		
Length	15′	11½″
Width	5′	6½″
Height	4′	2″
Length of body—inside top		108″
over-all		118½″
Width of body—inside top		73½″
over-all		74″
Depth of body—inside front	1′	4″
Road Clearance—minimum		8″
Height of body in dumping position	10′	2″

Speed: MPH, loaded
Forward: 3.4 1st; 9.4 2nd; 27.2 3rd
Reverse: 3.4 1st; 9.4 2nd; 27.2 3rd
Maximum speed on a fifteen per cent grade with heaped truck load 5-7 MPH (Maximum recommended for underground)

Body Capacity:
Struck loaded—6 tons

F.O.B. shipping point—St. Louis, Missouri
90 day warranty on all parts with exception of Engine and Transmission which carry manufacturer's standard warranty.

*

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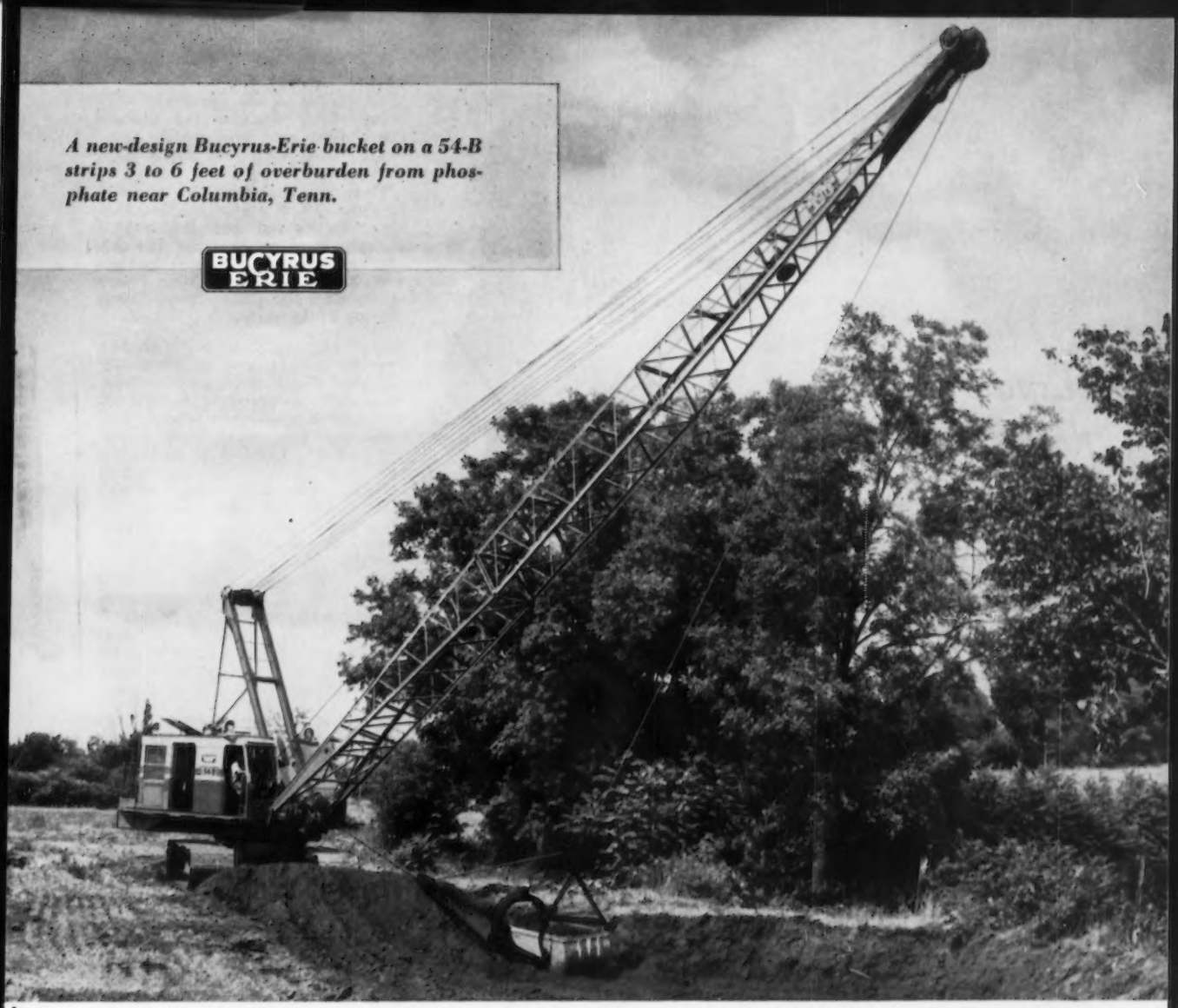
SALES OFFICE • 326 South Grand Ave., St. Louis 3, Mo.



A new-design Bucyrus-Erie bucket on a 54-B strips 3 to 6 feet of overburden from phosphate near Columbia, Tenn.

Designed to Outstrip--Built to Outlast

BUCYRUS-ERIE NEW DRAGLINE BUCKETS

Big dragline output comes more easily when you are swinging an *all-new* Bucyrus-Erie bucket. Its weight is correctly balanced and teeth properly pitched to speed penetration of the cutting edge and thin "slicing-action" lip. Its tapered basket fills fast. Precise flaring and accurate balance minimize bobbing and spilling. Clean inside design of the basket and extra high arch assure clean, fast dumping.

These new buckets are made of BECOLOY, a new steel developed by Bucyrus-Erie metallurgists. BECOLOY has high impact and shock resistance even at low temperatures. Its great strength per pound lets you swing more payload, less deadweight every shift. Maintenance costs are low since BECOLOY can be cut with an acetylene torch and is readily weldable.

Bucyrus-Erie dragline buckets are available in a wide range of sizes for light, medium or heavy-duty service . . . with solid or perforated baskets. Call on your Bucyrus-Erie distributor . . . he'll gladly recommend the right bucket for your dragline and specific use. 25R57C

BUCYRUS-ERIE COMPANY · South Milwaukee · Wisconsin

Handle tough fluid mixing jobs...

without costly maintenance

Why you'll never have to replace a gear because of shock loads on this mixer

Here's one mixer you *won't* have to tear down for expensive, time-consuming repairs.

No matter what fluids you're mixing, normal shock loads on the mixer shaft can't damage the gears—ever.

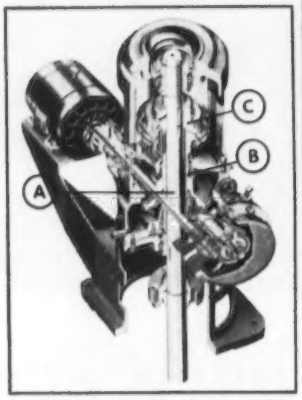
You get years of low-cost fluid mixing because of this "flex-protected" construction. It's exclusive with Series "E" LIGHTNIN Mixers.

Results guaranteed

You can meet the toughest fluid mixing requirements with LIGHTNINS. There are hundreds of standard power-speed combinations, in sizes from 1 to 500 HP.

Mixing results are fully predictable—unconditionally guaranteed.

How do you translate these facts into the dollar savings *you* can make with LIGHTNINS? For details, just call your nearest LIGHTNIN Mixer representative (listed in Thomas' Register). Or write us direct for complete description of Series "E" LIGHTNIN Mixers. Just ask for Catalog B-102.



Isolates gears for longer life

The mixer shaft (A) passes through a drive quill (B). Shaft and quill are suspended on separate sets of heavy-duty bearings. Power is transmitted from quill to shaft through a flexible coupling (C). This coupling accommodates shaft flexures, soaks up shock loads, and *isolates shaft stresses from the gearing.*

GET RAPID, THOROUGH MIXING in any open vessel with LIGHTNIN Portable Mixers. Thirty models; electric or air driven; direct or gear drive. Sizes ⅛ to 3 HP. Request descriptive Catalog B-108.

"Lightnin" Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc.

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Idaho (*Continued*)

Dollar, Silver Syndicate and Sunshine Consolidated under profit-sharing agreements. Gross value was nearly $5.5-million.

These three large companies accounted for about 83% of the district's total 1956 ore production and approximately 85% of the value of ore produced. The only other producers of significant tonnages were Day Mines' Dayrock Mine, Polaris Mining Co.'s Silver Summit, the Sidney and the Lucky Friday.

Bunker Hill Co.'s northerly crosscut from the No. 11 level of the Bunker Hill Mine toward the old Senator Stewart property southwest of Kellogg has intersected a "blind" vein structure containing good lead ore, according to company officials. The vein is about 2 ft wide at the point of intersection, with additional mineralized stringers in both walls, and is considered "very encouraging" since it is in a previously unexplored section of the Bunker Hill property.

The exploration heading is being driven under an operating agreement with Silver Bowl, Inc., owner of the Senator Stewart claims. It still lacks several hundred feet of reaching the first "participation" area in which Silver Bowl will have a share of production.

American Smelting and Refining Co. has concluded arrangements with Golconda Lead Mines for milling current production from its Morning Mine at Mullan at the Golconda custom concentrator east of Wallace. The Morning mill was destroyed by fire on May 21, and no decision has yet been reached as to whether or not it will be replaced.

Morning mine production is presently ranging from 100 to 150 tpd, entirely from development headings. This is roughly half the pre-fire daily output.

Hecla Mining Co. has taken over exploration of Idaho Custer Silver-Lead Mines Co's Livingston property in the Boulder District of Custer County under an operating agreement and expects to have shaft-sinking operations underway in July, following unwatering and rehabilitation of old workings. Initial phase of the exploration project provides for deepening the shaft 250 ft to the 2750 level and carrying out some 800 ft. of tunnel work and 2600 ft of diamond drilling on the new lower horizon.

MINNESOTA

New officers of the Lake Superior Mines Safety Council, elected at the 33rd annual meeting in Duluth in May are: A. J. Stromquist, Ishpeming, Michigan, director of safety for the Cleveland Cliffs Iron Co., president; S. B. Slade, Virginia, safety director for Jones & Laughlin Steel Corp. Minnesota Ore Division, vice president; Allen D. Look, Duluth, district health and safety supervisor with the U. S. Bureau of Mines, secretary, and A. J. Windl, Duluth, purchasing agent for Oglebay, Norton & Co., treasurer.

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with CF&I ROCK BOLTS and REALOCK FABRIC

When you use CF&I Rock Bolts and Realock Fabric for drift support, you know you're using a method that:

- **Is fully tested for safety.**
- **Offers proved savings over older methods (35% less than timber square sets and 30% less than wedge-type bolts and landing mats, according to tests conducted by one of America's most progressive mining companies).**

Why does the combination of CF&I Rock Bolts and Realock Fabric afford such economy? First, the method is much faster and more versatile than older ones. And miners are able to do their own rock bolting with the same machines used to drive the heading. This is possible because CF&I supplies ¾" high-strength rock bolts and Pattin Type D-1 expansion shell rock bolts with left-hand threads to allow tightening by the left-hand rotation of drilling machines.

Get the complete story on how you can use the safe, economical bolt and fabric method of drift support in your own operations. Write today for complete details.

Note: CF&I Rock Bolts of the slot-and-wedge type are also available.

A twenty-minute color movie on Rock Bolting entitled "Make Mine Safety" is available for showing upon request through any of the district offices listed below.

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Open Top and Sides Permit:
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DIVISION: MINING & MILLING MACHINERY

80 Broad St., New York 4, N. Y.

Minnecota *(Continued)*

The new flotation plant of Jones & Laughlin Steel Corp. Minnesota Ore Division at Calumet is in operation. The plant treats tailings from the original Hill-Annex mine tailings pond by spirals and froth flotation. Tailings are pumped to the plant by a hydraulic dredge. This is the first such plant on the Mesabi range.

J & L has resumed diamond drilling, suspended last fall, on iron ore lands of Quebec Cobalt & Exploration, Ltd. in Quebec province about 185 miles north of the Seven Islands port of Iron Ore Co. of Canada.

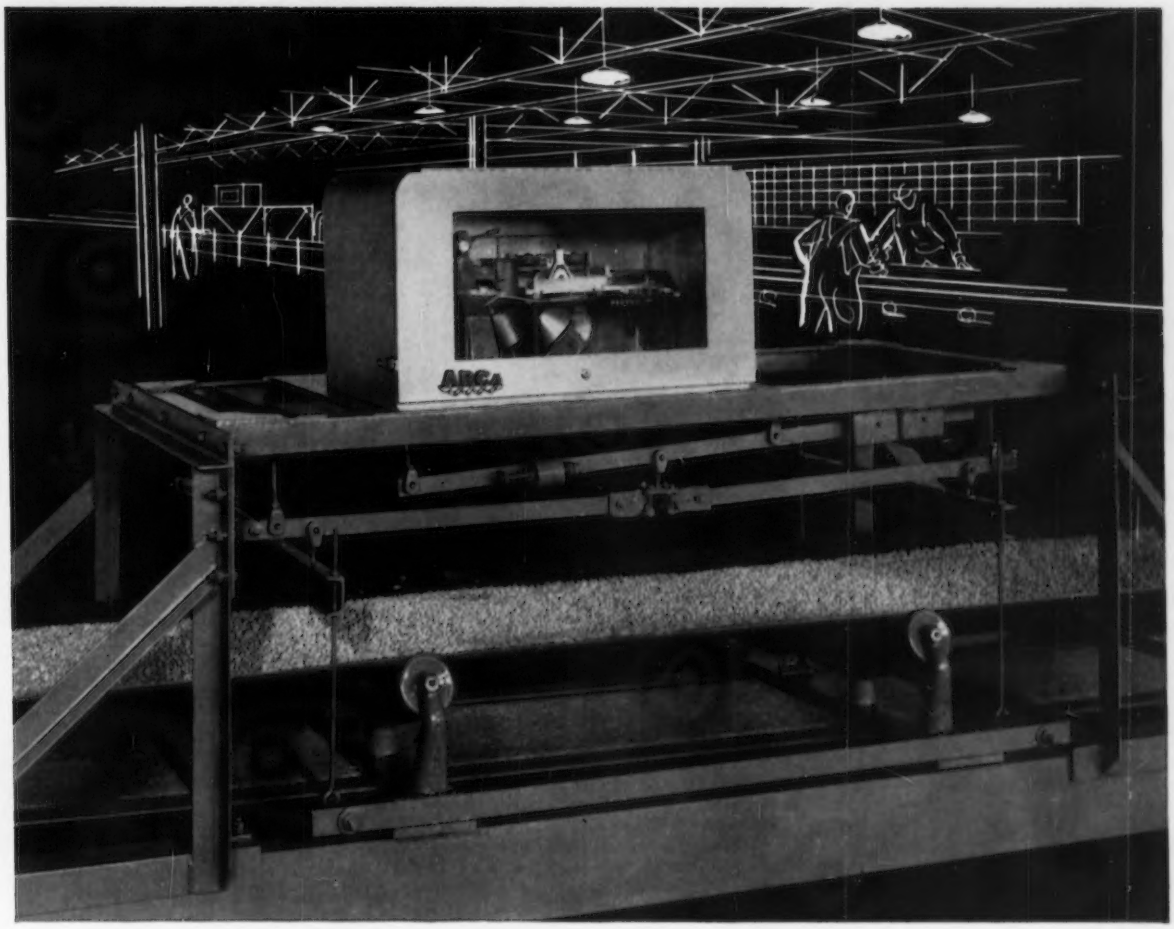
Occupation taxes paid by Minnesota mining companies on June 15 amounted to $27,480,461—over $4-million less than last year. The state treasurer said the drop was due to last year's steel strike which tied up ore production for several weeks. Twenty-three mining companies made payments of more than $100,000 each, with others making smaller payments. Oliver Iron Mining Division's portion of the tax was $16,677,383., $2.6-million less than last year. Oliver's percentage of total occupation tax was 60.69%, while its percentage of total ore shipments from Minnesota was 45.99%. The occupation tax on taconite production for 1956 was $297,063. as compared to $77,859. for 1955.

Two ore carriers which will be the largest on the Great Lakes are on order in Detroit. The Great Lakes Engineering Works has received orders for the 729 ft freighters from Bethlehem Steel Corp. and the Northwestern Mutual Life Insurance Co. 729 ft is the maximum length which can be handled at the Soo locks. Largest ore boat now in use is the Cleveland Cliffs' Victory which is 716 ft long.

Lake Superior Iron Ore Association, at its 63rd annual meeting in Cleveland June 11, voted to change its name to the American Iron Ore Association in recognition of increasing shipments from Canada and other areas of the U. S. Oliver Iron Mining Division Ford Motor Co., Steel Rock Iron Mines, Ltd.; Iron Ore Co. of Canada; and Reserve Mining Co. joined the association as new members. W. S. Moore, president of the W. S. Moore Co., Duluth, and R. T. Elstad, president of Oliver Iron Mining Division, Duluth, were among those named to the association's list of directors.

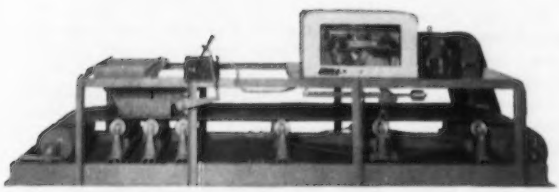
Minerals Beneficiation Sub-Section of the Minnesota AIME held its last meeting for the season at Hibbing June 19. The papers given at the meeting had been used at the annual meeting of the AIME in New Orleans last winter. One, by Fred DeVaney, was on "The Use of Cyclones in the Grinding of Taconite"; a second by S. E. Erickson on "The Development of the Hydro Cyclone" and a third by Earl Herkenhoff on "Factors Influencing the Choice of a Cyclone for Wet Classification." The papers by S. E. Erickson and Earl Herkenhoff were read by others as the authors were not able to be present.

M. A. Hanna Co. is opening two new



Accurate Blending Conveyor Scales and Feeders

...successor to TRANSPORTOMETER



An ABCs feeder with a power-operated regulating gate for feeding material at preset rates.

Now completely redesigned by McDowell engineers after exhaustive field and laboratory tests, ABCs equipment embodies those features users want most: simplicity of design; rugged construction; dependable operation; greater accuracy. ABCs belt scales and feeders are also engineered as complete control systems for the most challenging problems in feeding, weighing, blending, and totalizing of free flowing bulk materials.

V.C. Doversberger welcomes inquiries.

ABCs

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7476-ABC

SWITCH to skip haulage at the Nevada Mines Division Liberty Pit is due in mid-1958.

Skip Haulage Layout Set for Liberty Pit

KENNECOTT COPPER CORP.'s Liberty Pit at McGill, Nev. will convert to skip haulage from its current system of combined truck-and-rail ore and waste removal. Nevada Mines Division estimates cost of conversion to the new system at $1.5-million, according to John C. Kinnear, division general manager.

He said the installation, designed to improve operating efficiencies, increase production and help the division remain competitive in the copper mining industry, is scheduled to be completed in the second quarter of 1958.

Excavation for the skipway, hoist house and new rail yard will be undertaken in the near future. Total excavation, which will be accomplished by Kennecott equipment, will require the removal of 2-million tons of earth. Bids were expected to be placed for fabrication and installation of the skip haulage equipment at an early date, Kinnear said.

The installation will make extensive fringe ores on the perimeter of the Liberty pit available to open pit mining methods. Necessary stripping of overburden to recover the fringe ores will be started simultaneously with progress on installation on the skip system.

The new hoist or skip installation will consist of two parallel tracks running down the side of the pit to the bottom. On each of these tracks will be mounted a 35-ton ore carrier which will work in balance.

At the edge of the pit will be a structure similar to the head frame of an underground mine which will contain the bins from which ore will be loaded into the railroad cars for transportation to the reduction plant at McGill. Behind the head frame will be the customary hoist house containing the large motors capable of raising the 35-ton loads of ore and waste.

It is planned to install three loading points at various elevations along the tracks so that truck haulage units can most effectively dump the ore and waste into the skips for removal to the pit rim.

Minnesota *(Continued)*

open pit mines on the Cuyuna range on which it has leases: the Robert in the village of Cuyuna where Zontelli Brothers have begun stripping; and the Musser, formerly known as the Section 33, where the Hanna Co. is doing the stripping with a 7W dragline. The Musser is north of the Maroco.

Oliver Iron Mining Division has opened its Pilotac plant at Mt. Iron for regular visiting days by tourists and interested residents. Seven observation stands at its various open pit mines along the range are also open for visitors.

The fine ore section of the M. A. Hanna Co. Hunner mine heavy media plant, begun late in the summer of 1956, has been completed and is in operation. It is a 63x65 ft addition to the heavy media plant and is known as the "cyclone plant." This is the company's fifth cyclone installation since the first commercial plant at the Buckeye in 1951. As a result of experience in the other plants and constant research, the Hunner mine plant contains some new features. It treats the classifier product; but, in this plant, that product is first screened to eliminate the finer portion. The oversize from the screens is dewatered before going to the cyclone separators, while the undersize is fed to the spiral plant. "In the first cyclone installations, the magnetite media was recovered only by the magnetic separators. In the Hunner plant, the first recovery of media is made on drain screens, with only the undersize from the wash screens going to the magnetic separators." Also the Hunner plant uses a vibrating feeder, instead of the pan type, at the 150 ton surge feed bin.

Inland Steel Co. is preparing for a new shaft at its Armour No. 2 property at Crosby on the Cuyuna range. The lease on its Armour No. 1 will expire June 1, 1959. The new shaft will be similar to No. 1, with two skips and a cage. It will be 500 ft deep and while sinking is proceeding from surface, sinking and raising on the shaft will also be conducted from underground. A drift for this purpose has been driven on the 348 ft level. Herbert Nyberg is mining captain at the Armour mine.

M. A. Hanna's new development in recently vacated North Hibbing which includes the Norpac, Impro and Pillsbury (now the Roy) mines will be called the Pierce Group in honor of H. L. (Roy) Pierce who, in 1938, became vice-president and director of all the Hanna iron ore companies. He is now chairman of the board of Hanna Nickel & Smelting Co. and is also doing consulting work for the M. A. Hanna Co. He resides in Scottsdale, Arizona.

Cleveland-Cliffs Iron Co. completed the main stripping program at its Sally mine near Bovey on the west Mesabi (formerly known as the South Judd) Feb 15. Ore from the Sally mine will be hauled to the company's Canisteo mine during the winter months for treating at the Canisteo plant during the following season, meanwhile being stocked in the Canisteo pit.

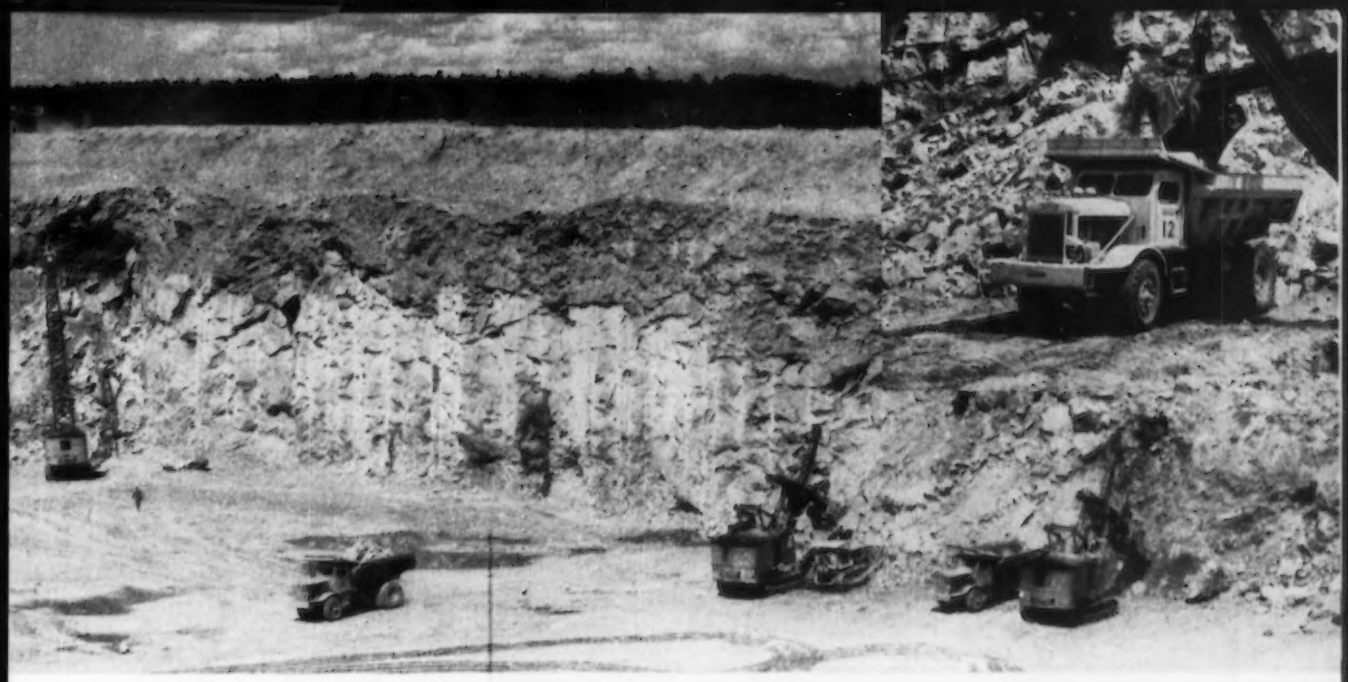
MICHIGAN

United States Metals Refining Co. now has six diamond drills exploring a large tract north of Wakefield, between the Gogebic iron range and the south shore of Lake Superior. The acreage is underlaid by large potential copper bearing formations.

Cleveland-Cliffs Iron Co.'s Mather mine on the Marquette range has constructed a tunnel underneath the large mine rescue training room at "B" shaft which is used for training mine rescue squads. The tunnel can be filled with smoke, closely simulating conditions in an actual mine fire. The men receiving the training cannot enter without their oxygen apparatus. They are trained in crews of five and are given real work to do, such as building a brattice from plank and poles placed near the mouth of the tunnel. The men who take this training course receive the best possible preparation for the hazardous job of fighting a real underground mine fire—one of the things most dreaded by mining supervisors.

Geologists state that Michigan's high grade ore would be exhausted in five years or less at the present rate, but estimate there are 2-billion tons of low grade ore in the first 10 ft below ledge in the state's three iron ranges. Two of the three ranges, the Marquette and Menominee, are already mining and treating some of this vast reserve of low grade iron material.

Annual report of the Quincy Mining Co. for 1956 shows 988,041 tons of sands from the No. 2 stamp sands were treated at its reclamation plant at Mason in 1956. The plant worked on a 24 hour



with Scrapers and Rear-Dumps

Euclid equipment proved its reliability and work-ability in the conversion of a peaceful farming area around Milford, Nova Scotia to a gypsum quarry.

Faced with moving a million bank yards of clay and 500,000 tons of gypsum rock, National Gypsum evaluated all makes of equipment—bought four "Euc" Scrapers, including an 18-yard Twin-Power model, and six 22-ton Rear-Dump Euclids for the rock movement. Sixteen months after the starting date, this big quarry site was stripped and graded—right on schedule. To fully clean the initial 15-acre quarry block, 7 million yards of clay are expected to be moved.

During early production at the quarry, four Rear-Dumps were hauling 5500 tons of ore to the hopper in an 8-hour shift. The haulage fleet is now composed of 10 of these reliable 22-ton "Eucs" used in the quarry and in the stripping operation in conjunction with a dragline. Six Euclid trucks currently used in the quarry deliver up to 1000 tons of gypsum per hour to the primary crusher bin.

Have your Euclid dealer give you information on the complete line of Scrapers, Rear-Dumps, Bottom-Dumps and Crawler Tractors...he has proof that ***Euclids are your best investment.***

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

Bulk Mineral Storage by the SAUERMAN Method

Reclaiming Triple Superphosphate to Hopper

Overall View of Storage

How Sauerman Scraper Storage Reduces Costs

200,000 tons of triple superphosphate are produced each year in this new Florida plant. It is delivered by overhead conveyor to a 329′ x 146′ storage building of 35,000 ton capacity. The material is then stockpiled and reclaimed by a 2½ cu. yd. Sauerman Scraper at a rate of 150 tph.

Here's how a Sauerman Machine cuts costs:

One operator, located in a safe station overseeing the entire area, can recover practically 100% of all stockpiled material.

All highly machined parts, hoists and motors can be located outside of the building and protected from corrosion and dust.

When parts are replaced—sheaves, clutch or brake linings—the machine is restored to practically new condition, even though it may be twenty or more years old.

Only the Crescent scraper and cables contact the material. The scraper machine can be designed to operate the scraper on top of non-caving material. This allows the scraper to break down any high faces that may be standing.

Sauerman Storage Machines are built for hourly capacities of from 20 to 600 cu. yds. A partial list of producers and manufacturers using some type of Sauerman equipment includes:

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Crawford Chemical Co.
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Southern Agricultural Fertilizer Co.

For ways to reduce your material handling costs, write to Sauerman's experienced engineers. Request Catalog E, Bulk Storage by Scraper and field reports on handling of your material by Sauerman Machines.

SAUERMAN BROS. INC.
626 S. 28th AVE. BELLWOOD, ILL.

Crescent Scrapers • Slackline and Tautline Cableways • Durolite Blocks

Michigan (*Continued*)

basis and was closed only for holidays and repairs. 4,801,000 lb of copper was recovered, or 4.86 lb per ton of sands. Average amount remaining in the tailings was 1.84 lb per ton, which is considered very satisfactory. Exploratory drilling from underground in the No. 5 shaft area has disclosed "nothing of real value," but the work is being continued in 1957.

MISSOURI

Lewin-Mathes, a completely integrated manufacturer of copper and brass tube, pipe and rod, whose production ranges through secondary smelting to finished products, has been acquired by Cerro de Pasco Corp.

In December 1955, Cerro acquired Circle Wire & Cable Corp., a wire and cable fabricator, and last year added Fairmont Aluminum Co., an aluminum sheet producer, to its diversified operations.

MONTANA

An exploration program for iron ore shows proven reserves of 200-million tons of magnetite ore in the Dillon area. Dillion is about sixty miles southwest of Butte.

Minerals Engineering Co is considering establishment of milling facilities to upgrade the ore to 65% concentrate or better. Earl Craig, manager of the company's Montana division, said that total investment would be about $6-million should "an economic cost-price relationship be obtained".

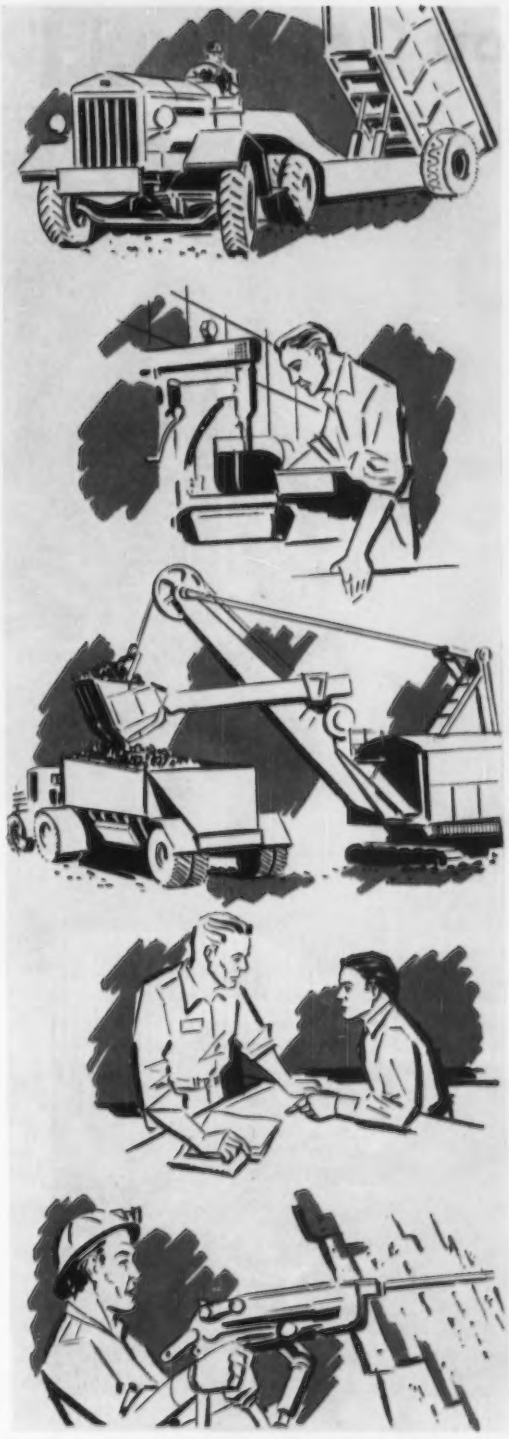
Mr. Craig indicated that the marketing possibilities were very good. He said that ultimate production could be about 500,000 tons per year with an employment of 125 men. All mining would be open pit.

The company began tungsten mining and milling in this area in 1953.

NEVADA

United States Lime Products Corp. has announced plans to build a $2-million industrial lime plant at Arrolime, 19 miles northwest of Las Vegas. Kennedy Ellsworth, Los Angeles executive vice president of the company, says the work has already commenced and that the project is expected to be completed in five months. It will have a capacity of 400 tpd and will include two large rotary kilns each 300 ft long and 9 ft in diameter, fired by natural gas. Nevada Natural Gas Pipeline Co. will lay a 12-mile-long, 12-in. transmission line to the plant, according to Harold G. Laub, president of the Pipeline firm. The plant will manufacture lime flux and lime products for use in steel making and chemical industries.

Getchell Mine Inc. during the last sev-



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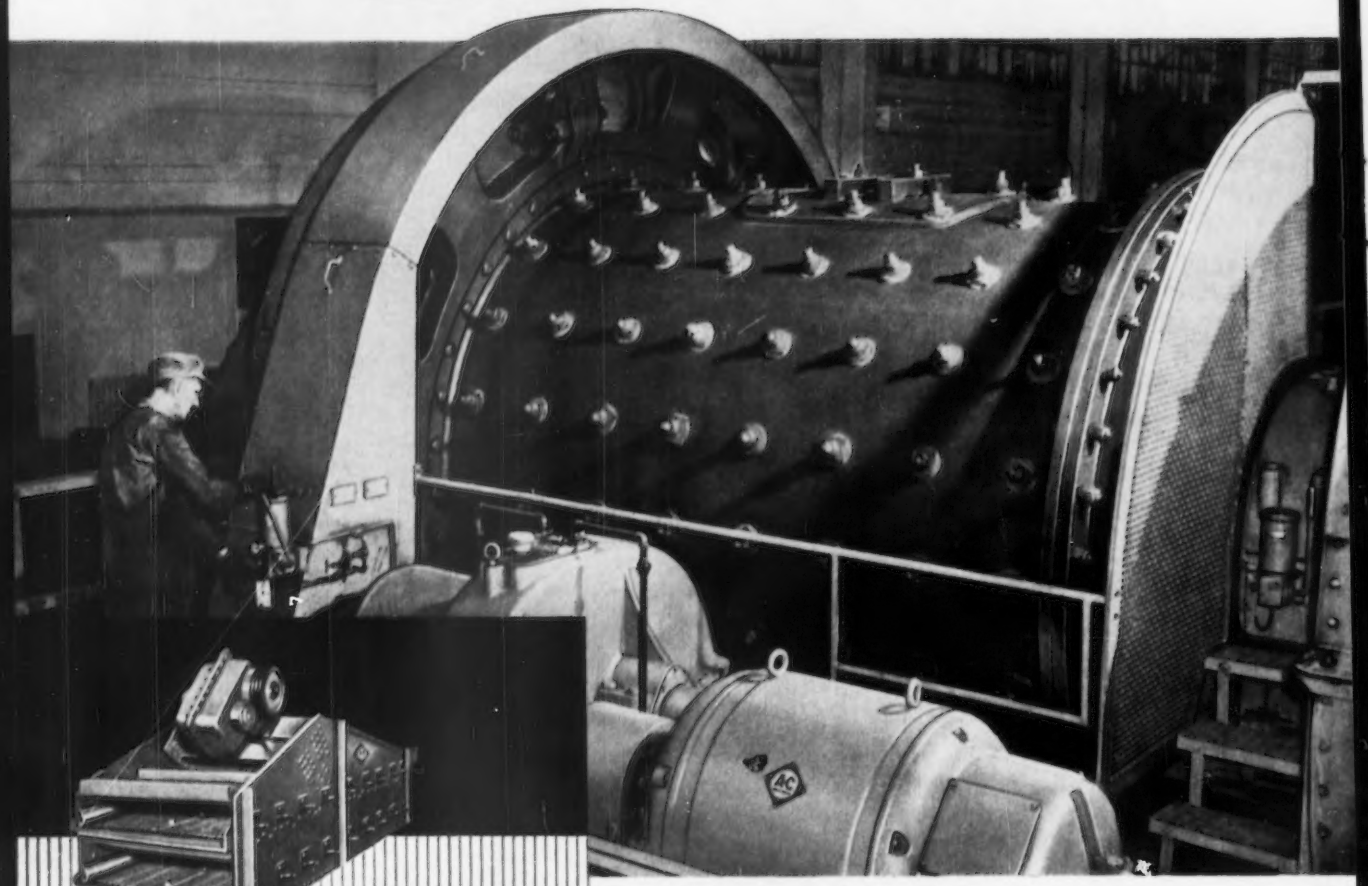

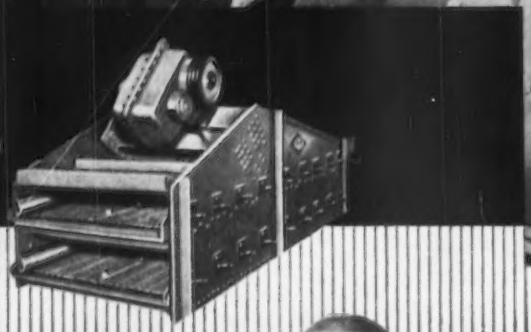

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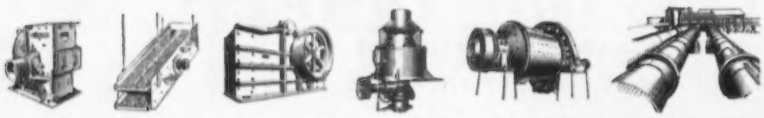

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A-3114

Nevada *(Continued)*

eral months has built a small pilot plant at the mine site at Tungsten in Humboldt County. George Wingfield Jr., president of the company, said it is designed for the production of synthetic scheelite and other tungsten products in demand by the steel industry. The work was done to confirm laboratory tests so that a plant can be designed for production of high purity and low cost tungsten concentrates along with other tungsten products. Molybdenum has been found on the property, and it is planned to mine it and treat it with facilities added to the present concentrator.

Western Fluorspar and Lead Mining Co., of Portland, Ore., has leased five fluorspar claims in Nye County and is carrying out pit mining operation on the site. The claims are situated east of the Cloverdale ranch in the Toiyabe forest region at an elevation of 6,100 ft. Lloyd Cline, president of the Oregon firm, said the ground was leased from Wright C. Huntley, of Bishop, Calif., and that sizeable reserves of commercial grade fluorspar have been revealed through sampling operations. Equipment was moved onto the site early in June, at which time extensive development work was started.

Southern Nevada Mine & Mill Co. is now employing seven men in operations of its gold and silver mining property and the nearby mill in the vicinity of Searchlight. Reports that the price of gold may increase are credited for the sudden upswing in activity. The property had not been worked for some time before last spring.

A group of White Pine County residents report what they believe to be a discovery of zirconium 12 miles southwest of Ely.

Fourteen placer claims have been filed with White Pine County Recorder by V. C. Segers, Leonard Distefano, Robert M. Durrin and John Smith, all of Ruth, Nev. and Jack Roland, Oklahoma City, Okla.

The prospectors allege their discovery is in form of a high-grade silicate.

Kelly & Clark Mining and Exploration Co. has completed work on a 250-ton bunker at the Bechtel Mine near Basalt in Mineral County. A high trestle was erected and a screening system installed in conjunction with the bunker. Underground work has exposed one vein of barite ore which is being exploited, and company officials estimate that approximately 30 ft of drift remains to expose a second vein of ore. Lead samples taken from the mine assay from $17 to $228 per ton and new equipment has been placed into operation to expand the underground development program. Directors of the company's barite property at Basalt recently met and named the mine in memory of George B. Bechtel, a director of the firm since August 1955, who died in a plane crash last October.

Continental Oil Co. has started drilling in the Hot Spot uranium claims which encompass the rodeo grounds near Mountain City in northern Elko County. Geologists for the company have been working on the site since early spring, and underground formations at depth are being tested by core drilling. Work was delayed for a time when a drilling rig being moved from Texas broke down en route. The claims were taken over from Enos Woodward, Tom White, Miltion Ray and Edson Gregory, all of Elko county, who were the discoverers.

NEW MEXICO

Four new uranium mines now are in production in the Grants district, State Mine Inspector John A. Garcia announced.

Two of the new mines are in the Ambrosia Lake area—the Section 10 shaft of Kermac Nuclear Fuels and the Section 14 shaft of Holly Minerals. Other new producers are the St. Anthony Uranium Co. mine north of Anaconda's Jackpile in Valencia County, and the Dalco No. 1 shaft in the Poison Canyon district of McKinley County.

Open-pit operations have been started by Ambrosia Minerals, Inc.; Brazos

There's a Good Reason . . . NEW JERSEY ZINC uses Greensburg storage battery locomotives

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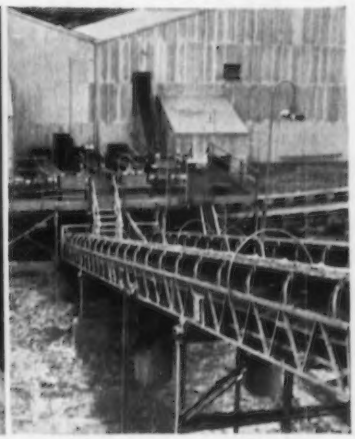

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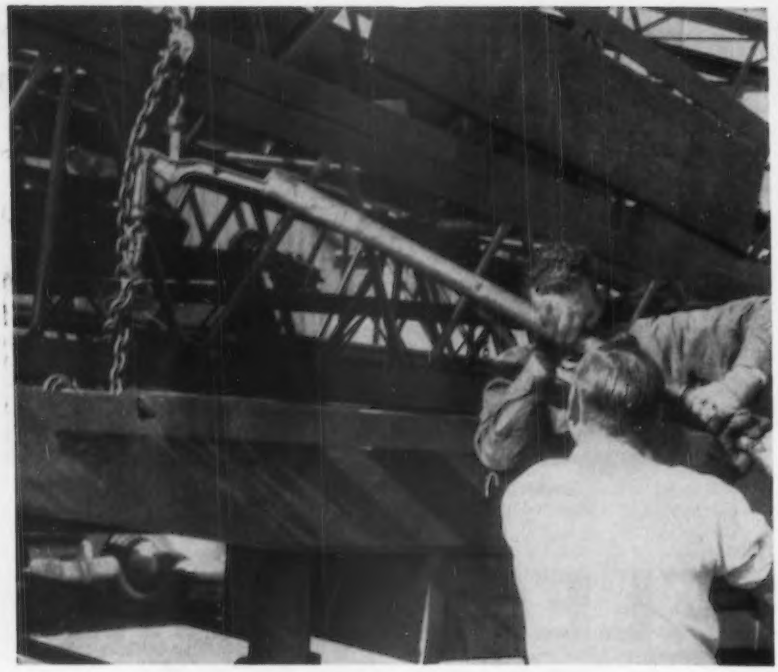

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There's no doubt about the safety of this load—or any load secured with Lebus Loadbinders. Completely drop forged, then heat treated for even more strength and durability, the millions of Lebus Loadbinders already in use have proved their ability to tie down loads of every description—keep them absolutely secured without failure *until they're released!*

You get an idea of this loadbinder's strength from the photo above. Two big truckers throw their combined weight on a long cheater without fear of breaking or bending any part—they know that, from handle to hooks, the Lebus is the strongest Loadbinder manufactured. You're assured of safe, dependable performance because each Loadbinder is thoroughly proof tested before shipment.

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New Mexico (*Continued*)

Engineering Co., Inc., and Essential Minerals Co., Inc.

NEW JERSEY

Five chemical and industrial firms are reported exploring the area around Camden, and the coastal plain for ilmenite. Deposits extending from the Camden suburbs to the east were discovered last fall by a member of the staff of the New Jersey Geological Survey.

Samples processed so far at Rutgers University, New Brunswick, have shown more than 2% ilmenite.

NORTH CAROLINA

Mineral Resources Committee of the North Carolina State Board of Conservation and Development, meeting at Morehead City, N. C., July 1, voted to lease 60,000 acres of bottomlands in Beaufort and Hyde Counties to the Bear Creek Mining Co. which will conduct exploration to determine if commercial quantities of phosphates are available in Eastern North Carolina to warrant a phosphate mining industry.

Bear Creek, a subsidiary of Kennecott Copper Corp., one of the two major concerns interested in the $40-million titanium plant to be erected at Wilmington, by Allied-Kennecott Titanium Corp., also plans to acquire some 250,000 acres from private owners in the area, the committee was told. Dr. Thomas E. Gillingham, company geologist, indicated that if phosphate is found in sufficient quantities, a plant costing upwards of $25-million may be built to process the mineral.

Under terms of the lease, Bear Creek will pay the State of North Carolina a minimum of $15,000 a year for up to five years while explorations are in progress, and once mining begins the state would receive a minimum of $100,000 per year, with royalties of 20c per ton on a sliding scale.

The lease was granted by the committee after G. Donald Emigh of St. Louis, director of mining for Monsanto Chemical Co., asked that not all state lands be allocated to any one company since Monsanto also is interested in exploring the phosphate deposits in North Carolina. He said it might be several months before it could get around to operations in the state, however.

Bear Creek has been engaged in exploratory operations for phosphates over a wide eastern North Carolina area for about a year.

The committee was told that the 60,000 acres now is the only State-owned land with proven phosphate reserves, but that phosphate may lie under any number of unexplored areas. It decided to lease the 60,000 acres to Bear Creek, pointing out that the company had done all of the exploratory work.

The deposit is said to be located about 100 to 150 ft below the surface, in a widespread layer.

New Timken® bit for air-leg drills and light stoping . . .

NEW TAPERED SOCKET
gives secure union

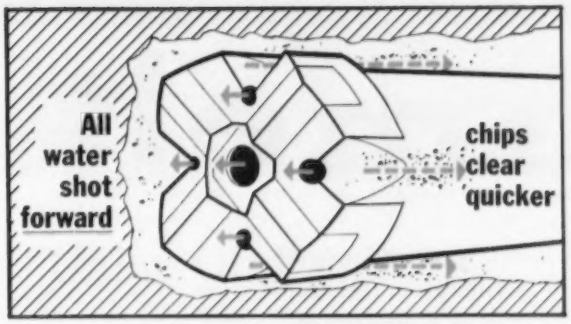
NEW FRONTAL DESIGN
speeds chip removal

You can lower your cost per foot-of-hole with this new Timken® tapered socket bit. With its uniformly tapered socket, the new Timken bit gives a secure union for feed-leg drills. The precision-made taper fits tight to the drill steel, reduces breakage.

And the bit is removable, lets you make quick, easy bit changes. You drill out full steel life.

The new frontal design, with its specially positioned five front holes and deeper, wider wing clearance, speeds chip removal. Drilling goes faster, costs are cut even more.

Special analysis carbides give superior wear-resistance with added shock-resistance. And the new Timken tapered socket bit can be reconditioned many times to give you more feet-per-bit. Comes in 3 popular sizes: 1¼", 1⅜" and 1½". The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



How New Frontal Design Speeds Chip Removal. The new five front holes direct air or water with jet-action velocity against face—wash away chips faster. Deeper, wider clearance between cutting wings works in unison with five front holes to give speedier removal of Rock Cuttings. Tests show these new features speed drilling, lower your cost per foot-of-hole.

TIMKEN MULTI-USE BIT (left) with correct, controlled reconditioning gives lowest cost per foot-of-hole when full increments of steel are used. **NEW TIMKEN THREADED CARBIDE BIT** (right) for other tough jobs. Improved thread contact reduces breakage. New wear-resistant carbides add life.

TIMKEN ***REMOVABLE ROCK BITS***

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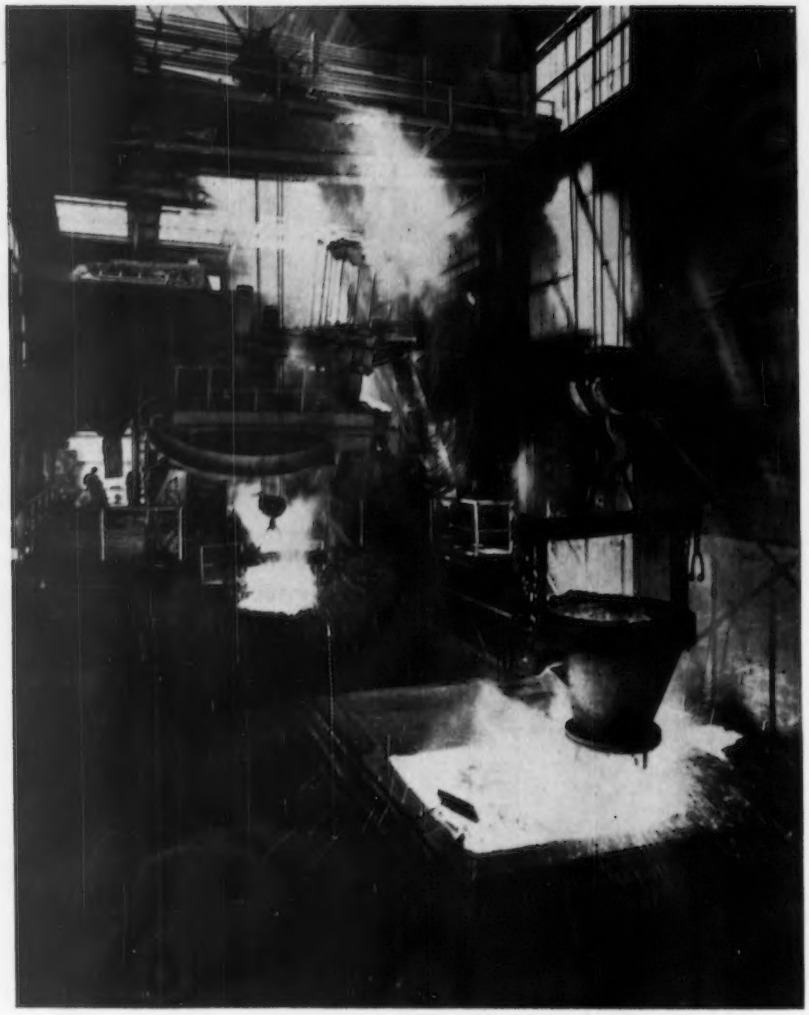

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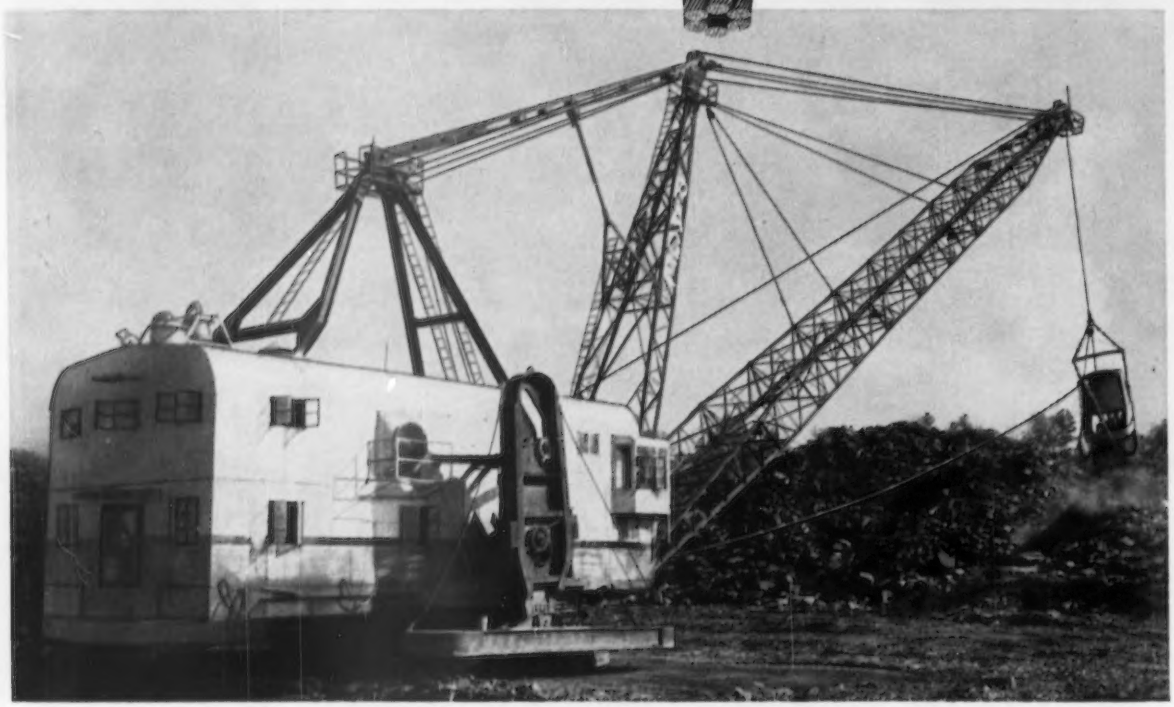

VHS Dragline Stars in Alabama

Mr. C. A. Lee, Superintendent, Marigold Coals, Inc., Jasper, Alabama, says: "Our Page Model 625 Dragline is used to remove overburden averaging 36 feet of sandrock and blue slate in our strip mining operation. This is rough service. The best Improved Plow Steel Draglines we could formerly buy lasted only from 700 to 750 working hours.

"Now, however, we've switched to new TRU-LAY VHS and we are consistently averaging over 1400 hours. Because of this longer life, we've been able to cut the 'down time' of the dragline for wire rope replacement almost in half—which gives us big savings in increased production and lowered maintenance costs."

Stronger and Safer—New TRU-LAY VHS is made from a new grade of steel for wire rope. It is at least 15% stronger than Improved Plow Steel, the strongest grade formerly available. This means you can now handle heavier loads with the same diameter of line. And you get a higher factor of safety . . . more resistance to shock loads or sudden overstresses.

Tougher, More Wear Resistant—New VHS is tougher, too. It was developed especially for the toughest construction and mining applications—draglines, shovel hoist ropes, scraper and dozer cable. Since it resists abrasion and does not become "hidebound" or lose its flexibility, it lasts longer in these services.

Saves Money—The longer life you get with new TRU-LAY VHS saves you money. And even more important savings are often made through higher production or lowered maintenance costs, since the longer life of VHS reduces the "down time" of important equipment for wire rope replacement

At Your Distributor—Your American Cable distributor has a complete selection of draglines, shovel hoist ropes, slusher ropes and winch lines of new tougher VHS in stock now. You don't need any complicated specifications to order them. Just call him today and tell him the size and diameter you want.

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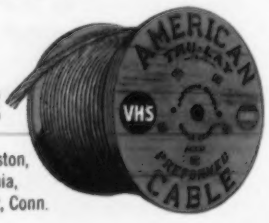


North Carolina *(Continued)*

Representatives of General Crude Oil Co. had expressed interest in the phosphate deposits, but failed to have a representative at the meeting.

The committee also heard inquiries from two groups about ilmenite leases in eastern North Carolina waters, but the committee decided it would grant no further ilmenite leases until Dr. J. L. Stuckey, state geologist, has completed a study of the situation. The inquiries were from a group in Onslow County, represented by State Rep. Carl Venters, and the Coastal Resources Company of Morehead City, N. C.

Little Switzerland Emerald Mines, Inc., of Little Switzerland, has been incorporated with the North Carolina secretary of state and plans to reopen the old emerald mines on Crabtree Mountain in Mitchell County.

W. B. Tweet of Augusta, Ga., is president of the new corporation, and the other incorporators are W. C. Meekins and Landon Roberts, both of Asheville, N. C.

The mines, consisting of three shafts, one of which is around 200 ft deep, deep, were reopened in 1919, 1935 and 1942, but none of the operations continued very long although a new vein reportedly was discovered. Expense of the operation did not justify the continuance of the mining.

OHIO

Armco Steel Corp. has purchased a sintering unit at its Hamilton plant, which it has been leasing from General Services Administration. Armco has been leasing the unit since 1943, when it was built by Reconstruction Finance Corp., and paid the Federal agency about $580,000 for the facility.

OREGON

Old Dry Diggings mine three miles east of Grant's Pass, in Josephine County, has been reactivated by Walter J. Cannon of Grant's Pass.

Exploratory work is underway and Little Giant Straub mill is being installed.

Cannon has uncovered gold-bearing ore in place in the decomposed diorite country rock with value reportedly $16 a ton and up.

The mine was originally worked as a hillside placer and reportedly produced $200,000 in gold.

John Allen and Ernie Craig of Richland, Ore., have taken over the old Miller & Lane property on Gold King Creek in the Eagle Creek district of Baker County, inactive since 1912. They are now driving an exploratory tunnel on what is known as the Old Arrasta level on basis of findings disclosed by rehabilitation of some of the old workings last year.

Ore mineral consists chiefly of gold and silver sulphides in a quartz vein matrix.

William Gardner & Son, Canyon City, have taken over operation of the Haggard & New chromite mine on Dog Creek in Grant County. They have stripped overburden from the surface around old glory hole workings in preparation for mining of a lens of milling-grade ore situated underneath.

The property has produced consistently since December 1953, with total value of shipments by all lessees from 1953 to Jan. 1, 1957, in excess of $250,000.

The lime burning plant at Wingville of the Chemical Lime Co. is nearing completion. The burning facilities are planned to turn out about 200 tpd of burned lime products.

Primary crusher installation has been completed at the quarry in Marble Mountain.

J. E. Fitzpatrick is making pilot sampling tests of ores from a tungsten prospect located near head of Chicken Creek in lower Burnt River district of Baker County. Ore is scheelite which occurs in narrow seams in a decomposed quartz diorite. Fitzpartick reported a five-ton test run yielded 350 lb 68.4% WO_3 concentrates. Heads reportedly assayed 2.7% WO_3.

PENNSYLVANIA

Improved technology and shortages of "the proper type of ore" will force U. S. Steel to close its Donora zinc mill in November of this year, according to L. F. McGlincy, district manager of operations of the division.

Annual capacity of the zinc plant is 70,000 tons of slab. The sulphuric acid works, also at Donora, will continue producing 160,000 tons per year, the official said, and many of the zinc plant's employees will find employment there. The steel and wire works at the site will also continue operation.

TENNESSEE

Department of Interior has announced awarding of a $52,975 DMEA loan to New Jersey Zinc Co. for zinc exploration in Grainger County. Amount of the loan is matched by the participating company.

UTAH

Boyles Brothers Drilling Co. is conducting deep shafting sinking in the U. S. Section of the Lark-U.S. Mine of United States Smelting Refining & Mining Co.

The venture located in Bingham Canyon, has been described by representatives of western mining operations of the smelting company as essential to continued operations in future of this lead-silver-zinc property.

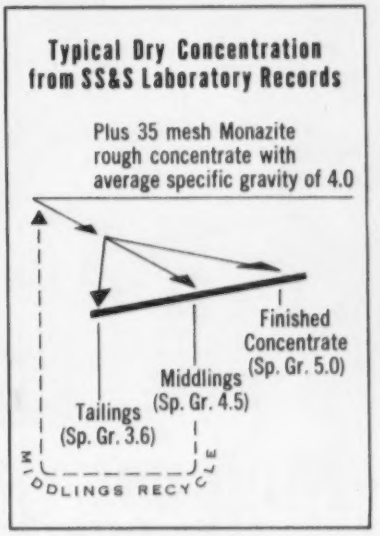
Details of the project were not announced by the firm, however.

Years of work toward clearing legal and property barriers leading to draining of

CAN THIS BE YOUR PROFITABLE "FINISHING TOUCH"?

Currently, one of the most significant applications of *dry concentration by fluidization* (with Sutton Gravity Separators and Stoners) is the finishing or upgrading of mineral concentrates and semi-concentrates to premium specifications.

Typical Dry Concentration from SS&S Laboratory Records


Plus 35 mesh Monazite rough concentrate with average specific gravity of 4.0
Finished Concentrate (Sp. Gr. 5.0)
Middlings (Sp. Gr. 4.5)
Tailings (Sp. Gr. 3.6)
MIDDLINGS RECYCLE

Other examples: to raise Zircon to over 66%; to raise Manganese from 15% to 40%.

For any job your present mill procedure cannot finish, check with Sutton.

For additional information, write Dept. EM, Sutton, Steele & Steele, Inc., 1031 South Haskell, Dallas, Texas

SUTTON, STEELE & STEELE, INC.

SEPARATIONS

MORRIS meets the CHALLENGE of INDUSTRY'S NEW FRONTIERS

No Matter What Your Present or Future Heavy Pumping Problems Are . . . Morris Can Satisfy You NOW!

The new Morris Type RX Slurry Pump is specifically engineered to handle the viscosities, densities and special characteristics of the slurries and sludges developing from industry's ever-advancing products. It is engineering attuned to the future . . . designed to meet the demands of a towering tomorrow.

Rugged, Dependable, Trouble-Free; Operates With Minimum Attention . . . Cuts Maintenance Costs!

The new Morris RX is designed for performance perfection under all conditions, including heavy, coarse, fine slurries, dispersions and sludges. Operates at low speeds; quickly dismantled for inspection, avoiding lengthy lay-up time.

MORRIS MACHINE WORKS

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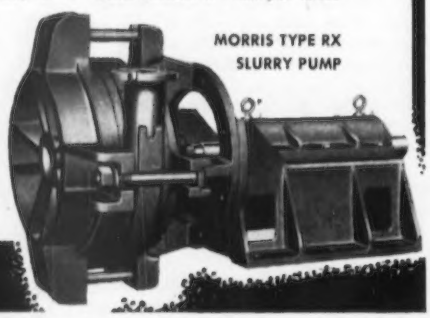
FREE SERVICE: Morris engineers will gladly recommend the custom-made pump best suited to your needs. Send necessary data today.



MORRIS TYPE RX SLURRY PUMP

MORRIS CENTRIFUGAL PUMPS

Utah *(Continued)*

the high grade lead-silver-zinc orebodies in the old Silver King Coalition Mines Co. claims in Park City District, finally have resulted in success.

But the project, because of depressed lead-zinc prices, probably will have to wait, officials announced.

Before the big plan could go ahead, it was necessary to complete the merger of United Park City Mines Co. with the Daly Mining Co. The latter firm controls the Ontario No. 2 drain tunnel which would be extended into the old Silver King working owned by UPC.

Late in June, Daly mustered the necessary two-thirds of its shares in favor of merger into and with UPC.

Enlargement and extension of the tunnel into the Silver King workings would drain the huge body of water which after World War II flooded "The King." In an effort to overcome the water problem, Silver King management installed the largest pumps (at that time) in history of underground mining in the U.S.A.

But pumping costs, inflationary wage and materials problems and fluctuating quotations for lead and zinc proved too much for the historic Utah mining firm. It went under.

Daly Mining traces its antecedents back to the days of the historic Ontario silver discovery which provided George Hearst with part of the necessary capital to back the Butte ventures of Marcus Daly. Daly himself brought the Ontario to the attention of Hearst and his associates in San Francisco.

Intermountain Experiment Station of Region III, United States Bureau of Mines, has been authorized to proceed with construction of A "hot laboratory" at its installation on campus of University of Utah at Salt Lake City.

J. Bruce Clemmer, station chief, said the laboratory, costing about $50,000, will utilize isotopes in tagging the course of various reagents and materials in processes of extractive metallurgy.

In this way, much can be learned on a measureable, precise basis about the elements of metallurgical process, Clemmer said.

United Park City Mines Co. has cut an important ore showing on the 1900-ft level of the Daly-West sector of its properties in the Park City District.

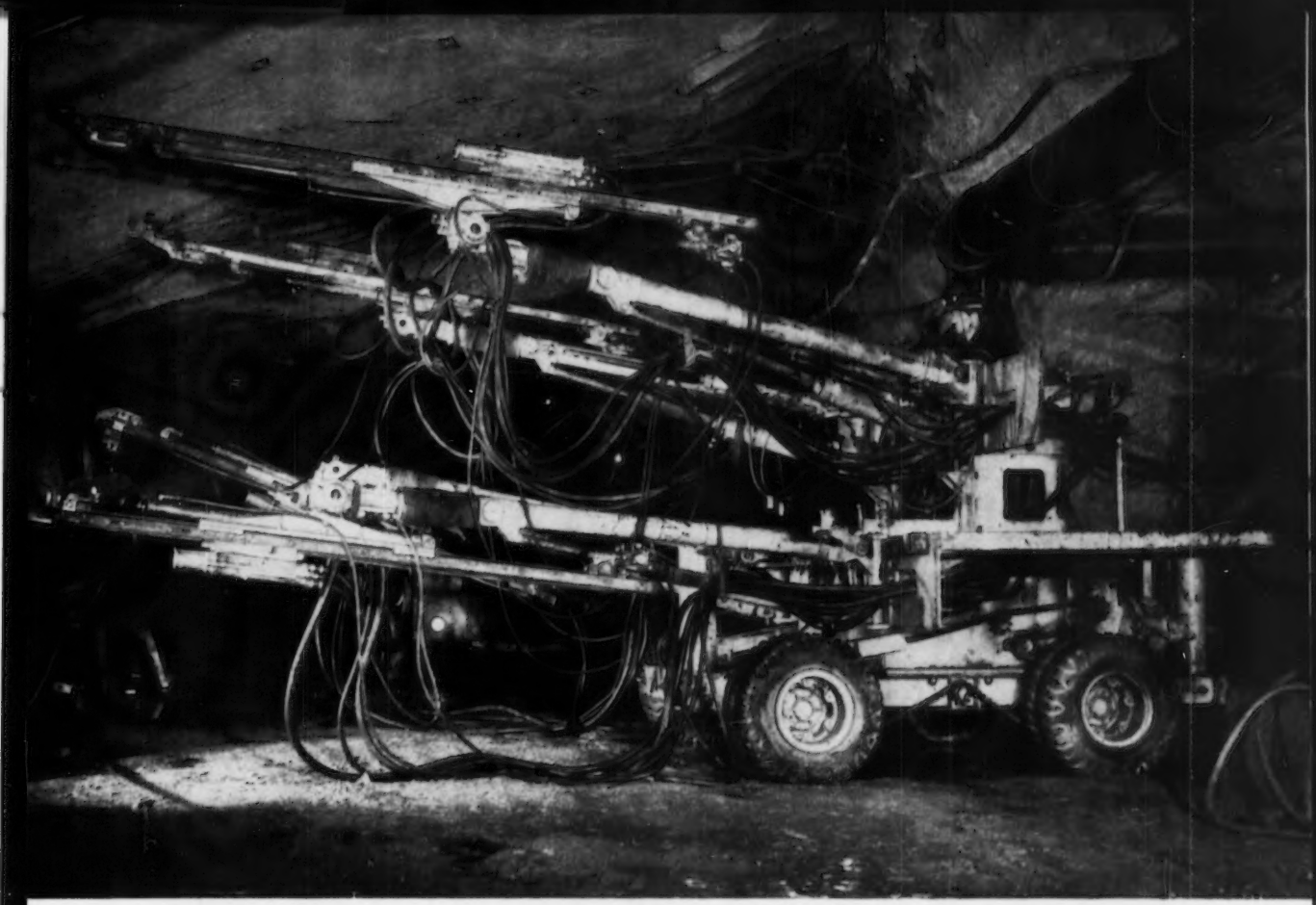
F. A. Wardlaw, Jr., vice president of the firm, said at Salt Lake City, that the fissure systems with apparent bedding planes are in the Wasatch formation and below a very sizeable orebody of the past on the 1700-ft level of the famous Ontario silver property of this mine.

But he said it was still presumptuous to assume any intimate relation between the two orebodies on basis of initial exploration to date.

The fissure has a 60 to 65 dip from the horizontal and miners have fired a number of rounds and are still in ore which runs from six to eight feet in cross-cut of the dipping orebody.

Thus a substantial amount of ore already has been uncovered.

Values so far are running up to seven



JOY DRILLMOBILES SPEED DRILLING IN CANADIAN URANIUM OPERATIONS

In the Blind River area the emphasis is on *speed.* And for fast, mechanized drilling Joy Drillmobiles are the choice. Mounting two, three or four powerful 3½ drifters on Joy Hydro Drill Jibs, these Drillmobiles are mobile marvels underground. Self-propelled with tractor-type steering, the Drillmobiles get into position fast—reach the tightest drilling locations. At the face, hydraulically operated Hydro Drill Jibs spot the drills quickly, smoothly, accurately. Double-acting power-lift and power-swing cylinders anchor the drills solidly—prevent creeping or settling.

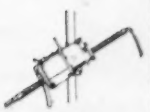
With the unequalled flexibility provided by extensible Jibs, the Drillmobiles can drill out rooms as wide as 32′ from a single setup—reach up to drill horizontal holes at a height of 18′. The powerful, high speed Joy drifters quickly drill deep hole rounds. Joy long chain feeds and tungsten carbide Rock Drill Bits practically eliminate steel changes. Automatic operation and remote control greatly reduce operator fatigue and increase safety . . . keep production up throughout the shift.

These are the reasons why Joy Drillmobiles are specified for high tonnage operations at Blind River. Talk to a Joy engineer about the Drillmobile for your operation. There are seven models to choose from.

Write to ***Joy Manufacturing Company, Oliver Building Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WBW M6728-188

JOY . . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY


Core Drills

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Rock Bits

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The tough ones...

come to Card

200 ROTARIES HAUL POTASH FOR INTERNATIONAL MINERALS & CHEMICAL CORP. POTASH DIVISION

Thirty new Rotary Dump cars recently placed in service bring to an even 200 the CARD Rotary Dump Mine Cars now in underground use at Carlsbad. Potash does not give the impact punishment CARD cars are taking in so many hard rock operations, but conditions are still tough.

Trains are long; haulage distances constantly increase; grades grow steeper. To keep in full operation economically, the cars have to be easy rolling, strong of frame, and solidly built against mild corrosion. All wheels are Timken bearing equipped and live rubber pads are used instead of conventional steel springs. They are 152 cu. ft. in capacity, struck measure, and track gauge is 42".

Aside from a heavier draft gear to meet the requirements of steeper grades and heavier trains, today's cars are little changed from those in the original order. Four re-orders over a period of years prove customer satisfaction at International Minerals & Chemical Corp.

You, too, can customize your haulage with an economical CARD design. Our engineers can furnish an efficient car to meet your most difficult specifications.

C.S. Card Iron Works Co.

2501 WEST 16TH AVE
DENVER, COLORADO

Utah *(Continued)*

ounces in silver, and seven to ten per cent each in lead and zinc. This makes the find a "high grade" one for the Park City District (and most other lead-silver-zinc districts of the west.)

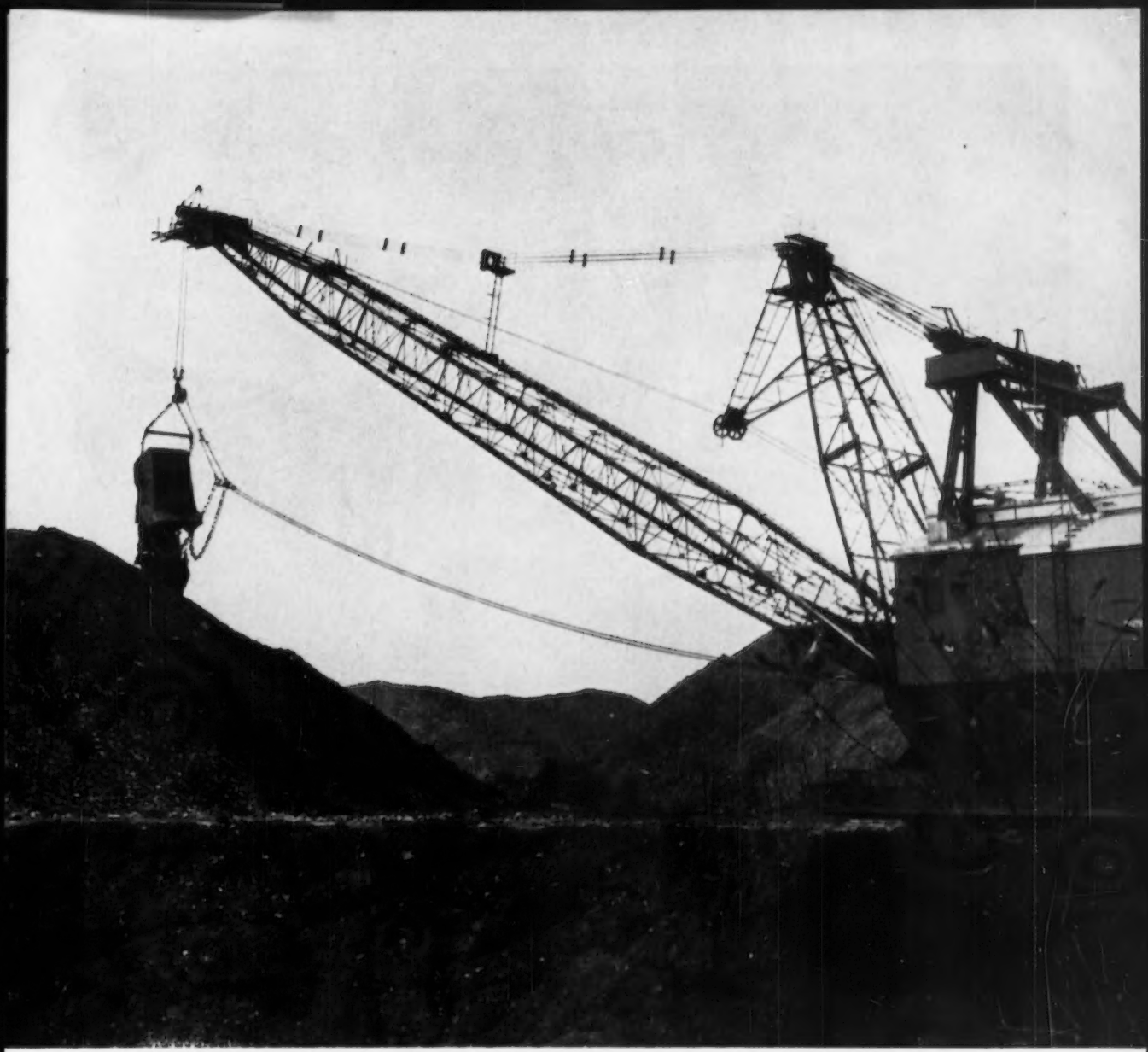
The Government's uranium ore-buying station and sampling plant, operated at White Canyon, since Oct. 1, 1954, ceased accepting uranium ore at the close of business on July 31, 1957, it was announced at the Grand Junction Operations Office of the U. S. Atomic Energy Commission.

The opening of the Texas-Zinc Minerals Corp.'s ore-buying station at Mexican Hat, Utah, on March 1, 1957, preparatory to completion of the mill now under construction, provides a market for ore produced in the White Canyon and Red Canyon areas. These ores will now be hauled to the Mexican Hat plant over a new direct road built by Texas-Zinc.

COLUMBIA SHAFT of Lisbon Uranium Corp., southeast of Moab, has been bottomed at 550 ft by Boyles Bros. Drilling Co. Operations by Hidden Splendor Mining Co. are expectel to result in shipments in October. New shaft is only a few hundred yards east of Homestake's La Sal, now producing 75 to 85 tpd.

A geophysical "radon" survey on the Rocky group uranium prospect of Sidney Mining Co. and Mascot Mines Inc. in the Blanding area of San Juan County, Utah, has outlined two major and two minor areas of high anomalies, indicating a strong probability of commercial orebodies beneath, according to M. C. Brown, Sidney president. Diamond drilling is now in progress to test the anomalous zones. The radon survey technique, developed by Kiva Explorations Inc. of Austin, Tex., is a promising new exploration tool which measures alpha particle counts in surface rock and thus delineates favorable areas for prospecting.

At Sidney's zinc-lead mine in the Pine Creek area of the Coeur d'Alene District, exploration work is being continued in both westerly and easterly



WIRE ROPE AT WORK

Here is a tireless mechanical monster that strips off incredible tonnages of dirt and rock as it digs for coal. It is the property of A. E. Dick Contracting Co., Hazleton, Pennsylvania. When photographed, the powerful dragline excavator was nearing a rich seam of anthracite that lay beneath the overburden.

Stripping has its own special torture-test for the wire ropes in draglines and hoist lines. But the ones on this machine can take it. They're Bethlehem Purple Strand—6 x 25 for the draglines, 6 x 41 for the hoist. The two draglines, with a diameter of 2½ in., were chosen for their combination of strength and abrasion-resistance. The 2-in. hoist cables have to be tough, strong, and highly flexible. Working as teammates, these Bethlehem ropes are part of the "muscle" that enables the excavator to master any stripping job.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

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Crushing 60,000 lbs. per week

of glass-sharp, extremely abrasive material is the job of these hammermill hammers. No wonder they become rounded and worn, as shown below . . . lose their cutting efficiency, require regular build-up.

HARDFACING WITH AMSCO® SUPER HF-20

doubles service life . . . cuts electrode costs

Welding Flux Processing, Chicago Heights, Illinois, know a good thing when they see one. That's why they've switched *exclusively* to Amsco Super HF-20 Electrodes for hardfacing of these hammers. They're saving three ways:

1. Service life of the built-up hammers and the mill housing itself has been doubled, because of Super HF-20's high abrasion resistance.
2. Super HF-20 electrodes cost about 40% less than the type previously used.
3. Welding speed is stepped up. Super HF-20, an iron powder "contact" electrode, is easy to handle and gives a high deposition rate.

In this and many other severely abrasive applications, Amsco Super HF-20 has *proved* its ability to provide superior wear resistance at low cost. Available from stock in 3/16" diameter, to handle hardfacing jobs of almost any size.

Call your nearby Amsco Welding Distributor now for a demonstration of Super HF-20. Or write direct for technical data to: Amsco Welding Department, Chicago Heights, Ill.

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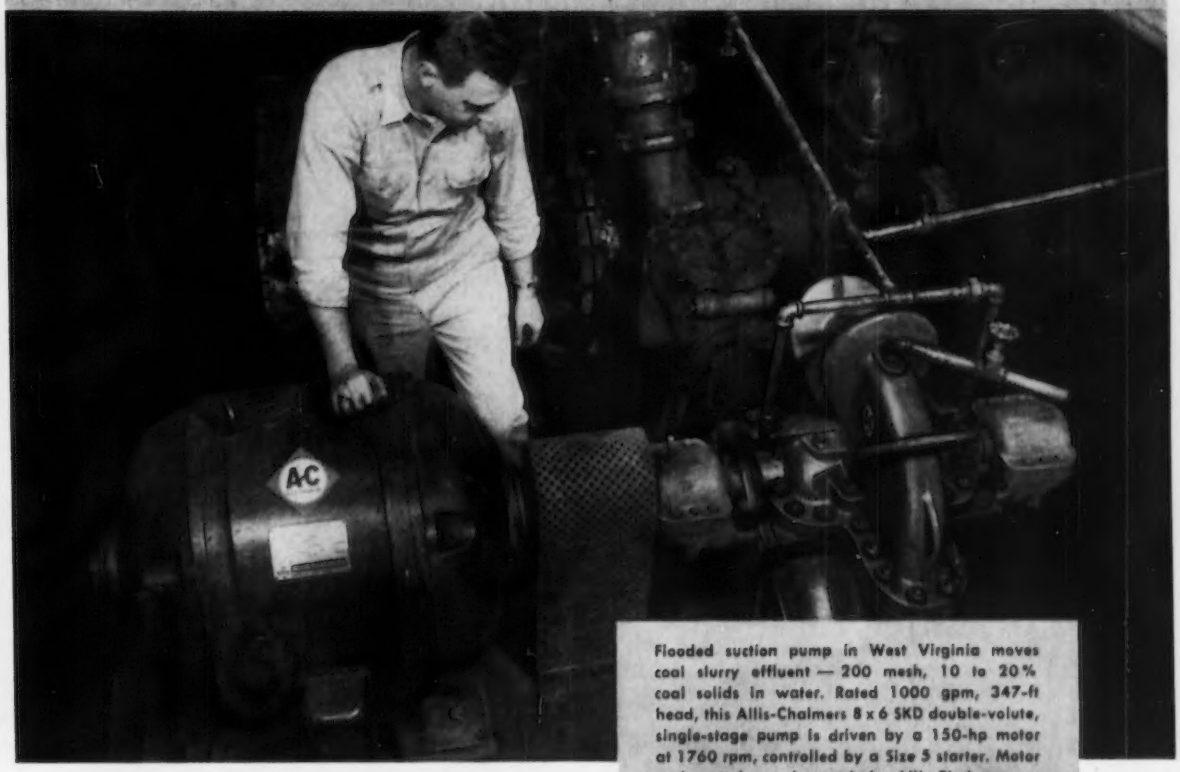
Coal-Washing Savings with Allis-Chalmers Pumps



Flooded suction pump in West Virginia moves coal slurry effluent — 200 mesh, 10 to 20% coal solids in water. Rated 1000 gpm, 347-ft head, this Allis-Chalmers 8 x 6 SKD double-volute, single-stage pump is driven by a 150-hp motor at 1760 rpm, controlled by a Size 5 starter. Motor and control are also made by Allis-Chalmers.

Custom-Assembled Pump

Costs Less

than a Standard Pump

Nodular iron, developed by Allis-Chalmers, cuts the cost of this pump. The ribbed casing was cast in *nodular* iron — it has the tensile strength of the standard pump made of steel but costs considerably less. Adjustable wearing rings are made of stainless steel. This application typifies Allis-Chalmers ability to custom-assemble liquid and solids handling pumps from standard components made of a wide variety of metals and alloys — to meet any conditions of temperature, corrosion and abrasion.

You Get MORE Pump Value ... When You Specify Allis-Chalmers

... because Allis-Chalmers pump development is based on extensive experience gained in supplying standard and special pumps to all industries for many years.

... because you specify from the world's widest pump range (1½ to 72 inches).

... because you get pump application and engineering advice from experts anxious to help you.

and MORE

... because Allis-Chalmers is the only company that offers pump, motor, drive and control as a unit, designed to work together — all built by one source, for "one source" responsibility.

For detailed pump information contact your local A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5305

USS SPECIAL STEELS

minimize break-in time • step up production
increase service life • reduce maintenance cost
FOR MODERN COAL-HANDLING PLANT

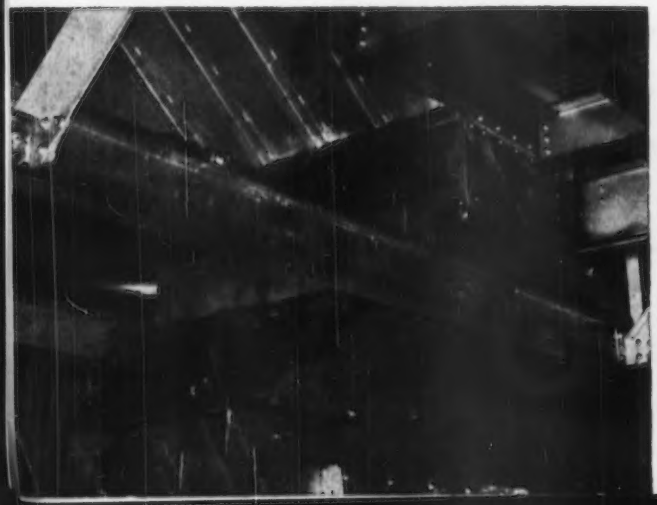
On its way from the mines at Lynch, Kentucky, to the Lake Shore coke plants, raw coal makes a very important stop at Corbin, Kentucky, at the U. S. Steel coal-cleaning plant. Here the coal is crushed, carefully blended to assure the best possible mix of coking coal, and finally cleaned and dried.

Over-all view of Corbin Plant

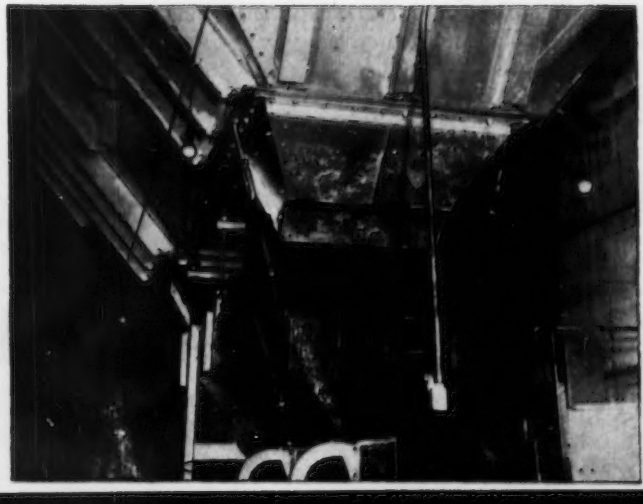
Throughout this plant, various USS Special Steels have been used to reduce operating and maintenance costs and to assure longer life in abrasive and corrosive applications. These steels include USS Stainless Steels, USS COR-TEN and USS MAN-TEN High Strength Steels, and USS Abrasion-Resisting Steel. Each is used for a specific purpose. USS COR-TEN Steel is used for chutes to provide the necessary corrosion resistance and load-bearing strength with minimum weight. To assure the utmost in abrasion resistance, these chutes are lined with wear plates of USS A-R Steel. Typical examples are hoppers and blending chutes, discharge and diversion chutes which are made of 3/16" USS COR-TEN Steel lined with 3/8" USS Abrasion-Resisting Steel.

Where corrosion resistance and slideability, in addition to longer life, are of paramount importance, USS Stainless Steels are used alone or in combination with USS COR-TEN Steel. USS Type 410 Stainless Steel is used to line the 3/8" COR-TEN Steel refuse sumps, the Chance-cone sump, the Bird effluent sump and the water-supply head tanks. Stainless Steel is used for the clean-coal and refuse sluices and in similar wet applications.

Diverter chute feeding raw coal into distributor is built of 3/16" USS COR-TEN Steel and lined with 3/8" USS A-R Steel.



Hopper and chute from blending bin. Outside is 3/16" USS COR-TEN Steel with 3/8" plates of USS A-R Steel bolted on inside.



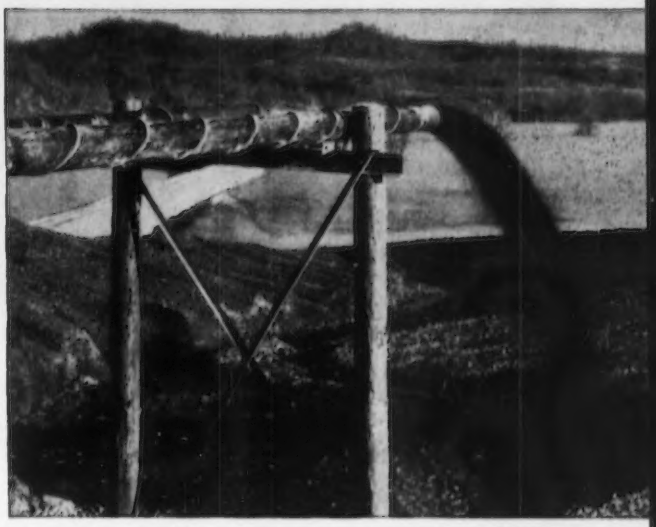
Outside of sluice—handling fines and refuse in water—is made of 3/16" COR-TEN Steel and lined with 3/16" Type 410 Stainless Steel.

Raw coal chute of 3/16" COR-TEN Steel lined with 3/16" Type 410 Stainless Steel.

Another important application of USS Stainless Steel is for the woven wire and perforated screens. Stainless Steel stands up extremely well here. It is estimated that the Stainless Steel screens will outwear carbon steel by three times, and they are far less apt to clog or "blind." Among the Stainless Steel screens used in the Corbin Plant is the first American application of the German Nein-Lehmann radial slurry screen which receives the slurry from the clean coal desanding system.

This screen used for reclaiming sand from the Chance-cone chute is Stainless Steel. The chute is USS COR-TEN Steel lined with Type 410 Stainless Steel.

Although these USS Special Steels for Mining Service have higher initial cost than structural carbon steel, the additional expense was fully repaid during the breaking-in period. Normally a plant of this type would require from 60 to 90 days to break in. But the Corbin Plant was operating fully in just one week, and much of this was due to the use of these Special Steels. An interesting point on the increased efficiency resulting from the use of these Special Steels is that this plant, scheduled to handle 600 tph., is now handling 800 tph. USS COR-TEN Steel, USS MAN-TEN Steel, USS Stainless Steels and USS Abrasion-Resisting Steel will continue to serve the Corbin Plant by assuring longer life, fewer breakdowns, less down time, smoother, faster operation and increased production. That's why we say that in the long run, *USS Special Steels for Mining Service don't cost more.*



At the end of the line plant, reject is pumped through this USS MAN-TEN High Strength Steel pipe to the refuse area.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
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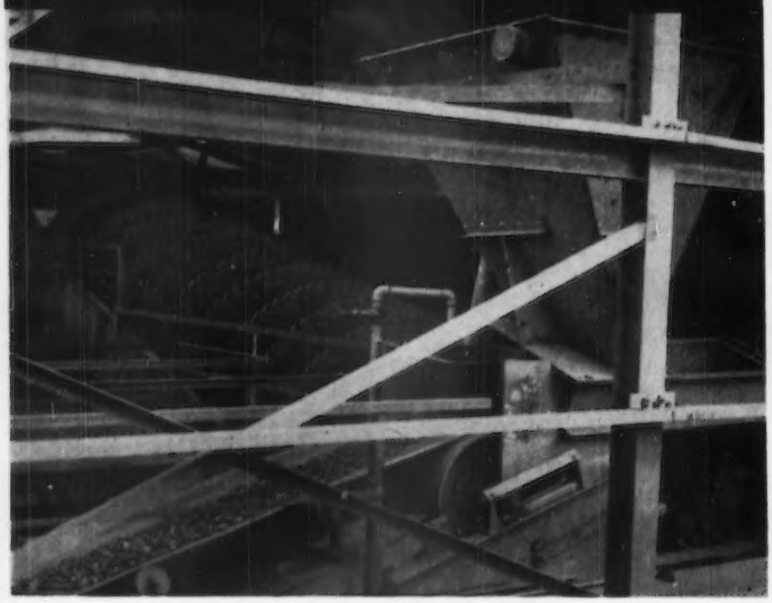
USS SPECIAL STEELS FOR MINING SERVICE

UNITED STATES STEEL

EXPERIENCE
has proved these advantages of
AKINS HMS SEPARATORS



- Gradation of pool density from feed entry point to sink removal point provides natural cleaning of sink, and allows circulation of media at lower gravity and viscosity.
- Start-up under full load, eliminates necessity of draining vessel after shutdowns.
- Entire vessel is visible and accessible.
- Variation in rate or grade of feed is not detrimental.
- Large pool area and volume minimize tramp refuse in the product and facilitate better recovery of values from fine sizes.
- 3-product separation in one machine allows extraction of middlings, requiring only one media cleaning circuit.

WRITE FOR NEW AKINS HMS MANUAL 56

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Utah (*Continued*)

headings on the new 2,300-ft level. The east heading is now well into adjoining Nevada-Stewart Mining Co. property and lacks less than 300 ft of reaching the target area.

VIRGINIA

Miners for New Jersey Zinc Co. recently completed a 2½-mile tunnel to connect the Austinville mine with the Ivanhoe. Latter is to begin production of zinc and lead shortly, but has no flotation mill.

Trains of 10-ton diesel locomotives and 80 cubic ft cars will haul ore to the crushing station below the tunnel at Austinville and ore will be hoisted to the surface there for milling.

WASHINGTON

Tunneling along a radioactive fault is underway at the Lowley lease shaft sinking operation of Daybreak Uranium, Inc., on the Spokane Indian Reservation. About 120 ft of the drift has been run from the bottom of the 60 ft inclined shaft. Work is being done by Addy Development Corp., contractor for the mining firm.

James W. Fox, Daybreak president, said assays have ranged from 0.19 to 0.45 uranium oxide. Cross structure development and diamond drilling are planned at the property, Fox said.

Daybreak Uranium, Inc., has uncovered two new pockets of high grade autunite ore at the firm's Huffman lease on Mount Spokane, Kae H. Sowers, secretary-treasurer, said. More than two carloads of ore have been stockpiled at the Huffman lease, he said. The first pocket was estimated to contain about 20 tons of ore averaging about 1% or better uranium oxide.

Work force at the Tacoma smelter of the American Smelting & Refining Co. has been reduced from 1,200 to 1,000 with the closing of two copper and gold mines in eastern Washington and British Columbia.

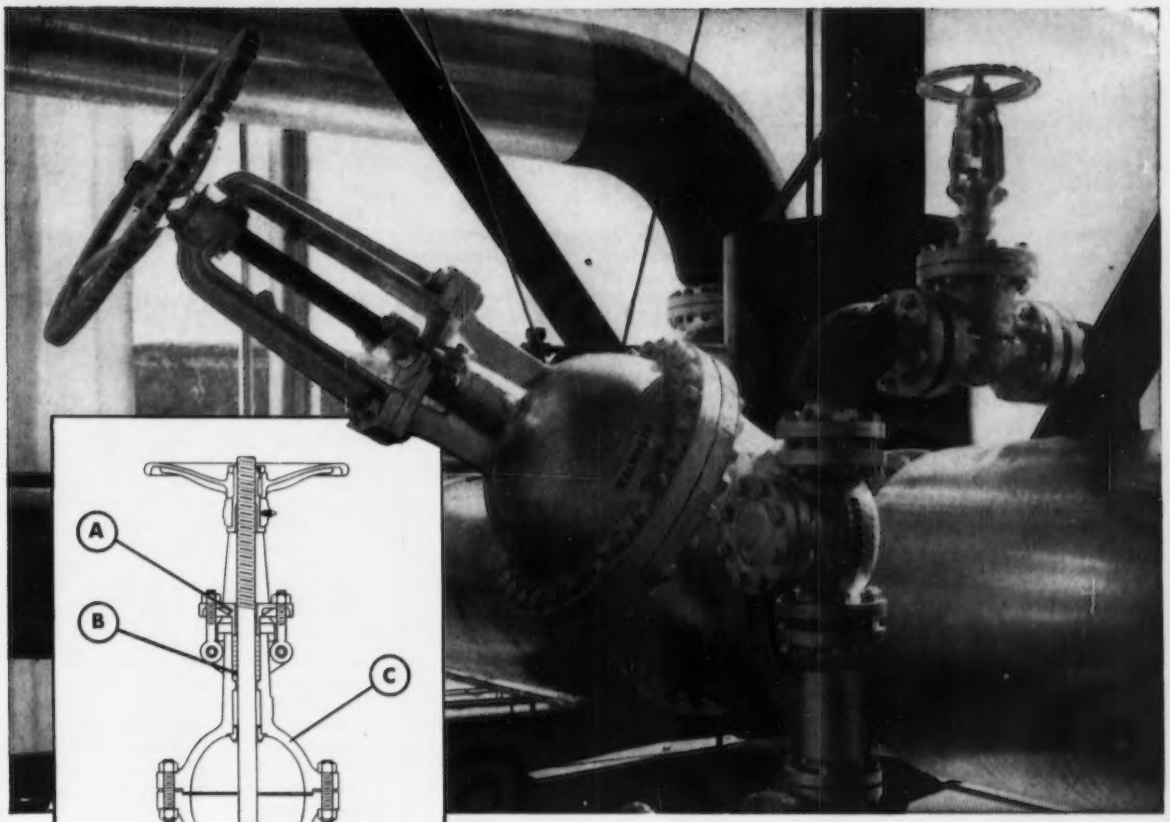
The newly closed mines are those of the Granby Consolidated Mining Co. at Copper Mountain, B. C., and the Holden mine in the Cascade mountains north of Chelan.

Only one of the smelter's two furnaces now is in operation.

Defense Minerals Exploration Administration's Northwest district office at Spokane said that approval has been given to fluorspar and manganese exploration projects totaling nearly $25,000.

A. E. Weissenborn, head of the district office, said the agency will provide $5,000 of the $10,000 estimated cost of a fluorspar exploration project by Squaw Creek Mining Co. at the Smothers property in Idaho County, Idaho.

The agency also will furnish $11,160 of the $14,880 to be used in exploring the Bear Creek manganese mine in Clal-



Walworth Series 150 and 300

CAST STEEL GATE VALVES OFFER YOU THESE FEATURES

for 'round-the-plant service

(A) GLANDS: Clearances between the gland and stuffing box, and gland and stem, are such that the stem cannot be scored even if the gland is pulled down unevenly.

(B) DEEP STUFFING BOXES: More than adequate in all sizes (2″ to 24″) to assure tightness and maximum packing life.

(C) BONNETS AND BODIES: Engineered to exceed the requirements of all applicable codes and standards. They are tough, durable, dependable.

(D) INTEGRAL GUIDE RIB FACES IN BODY: Machined to insure accurate centering of the gate.

(E) STURDY SEAT RINGS: Bottom-seated so that no recess exists at the back of the ring to cause turbulence, erosion and pressure drop.

(F) STREAMLINED PORTS: Permit unobstructed flow which results in minimum pressure drop and reduces the possibility of erosion.

Walworth Cast Steel Gate Valves can be furnished with either flanged ends or butt welding ends. Roller bearing yokes are available on the larger sizes. On valves 4 inches and larger, by-passes can be furnished. Walworth Cast Steel Gate, Globe and Check Valves from Series 150 to 2500, are available. For Series 600 and higher, we recommend Walworth Pressure Seal Cast Steel Valves. See your Walworth Distributor or write to Walworth for complete information.

WALWORTH

60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. · CONOFLOW CORPORATION · GROVE VALVE & REGULATOR CO. · SOUTHWEST FABRICATING & WELDING CO., INC. · M & H VALVE & FITTINGS CO. · WALWORTH COMPANY OF CANADA, LTD.

Washington *(Continued)*

lam County. The contract is with New Wellington Mines, Ltd., British Columbia.

WYOMING

Platte Chemical Co. of Salt Lake City has exercised an option to acquire land in Casper for erection of a $2.5-million sulphuric acid plant.

Thomas B. Harrison, president of Platte Chemical, said the proposed plant would be capable of producing 225 tons of sulphuric acid a day for use in processing uranium ore at nearby Gas Hills.

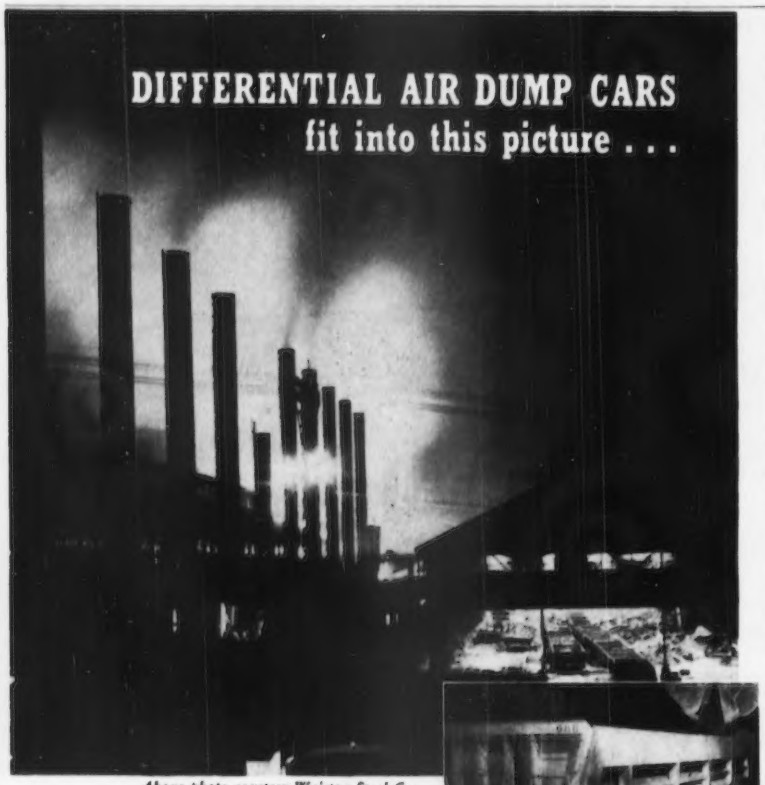
At present, sulphuric acid being used in the area is being shipped from Denver.

Pacific Power & Light Co. at Casper recently revealed that two chemical firms had been given firm power commitments for erection of sulphuric acid plants in Casper, but refused to divulge the identity of the companies.

Union Carbide Nuclear has purchased the Aljob Mining Co. uranium property in the East Gas Hills area for $400,000.

The purchase covers 26 claims.

Union Carbide has had an option on the property for nearly a year and has done considerable drilling. The Aljob mine has been one of the richest producers in the East Gas Hills.



Above photo courtesy Weirton Steel Co.

For day in, day out service — where the going is rough — where there's no place for weak sisters — more and more steel mills are choosing Differentials. Out at the dump they unload quickly and completely — will dump either way. Add up the score — you'll want Differentials in your line-up.

Differential Products Include:

Air Dump Cars, Charging Box Cars, Ingot Mold Cars; Locomotives, Mine Cars, Mine Supply Cars, Rock Larries, Mantrip Cars, Dumping Devices and Complete Haulage Systems.

DIFFERENTIAL
STEEL CAR COMPANY
FINDLAY, OHIO

SINCE 1915 PIONEERS IN HAULAGE EQUIPMENT

The transaction was an outright purchase and includes no royalty payments.

Sellers were Charles M. Smith, Mr. and Mrs. Alfred Nostrum, Mr. and Mrs. E. J. Bush, all of Thermopolis, Wyo; Mr. and Mrs. Bill Bush of Lander, and Mr. and Mrs. Bob Bush of Casper.

IN CANADA

NEW BRUNSWICK

Initial underground program at the base metal property of Nigadoo Mines Ltd, northwest of Bathurst, has confirmed earlier diamond drilling results. It is understood that further underground work will be carried out before decision is made on a mill. Some 600 ft of drifting has been completed on both the 175 and 300-ft levels. Surface diamond drilling indicated a length of 3,400 ft grading 0.5% Cu, 4.0% Pb, 3.5% Zn and 6.0 oz Ag per ton over a width of 6.5 ft. Zone was shown to extend to depth of at least 1,350 ft.

Tandem Mines is carrying out a diamond drilling program at its property in the Bathurst area. Geophysical survey, completed earlier this year, indicated two anomalies. Surface exploration, following the survey, uncovered a large area of gossan and this will be tested in the current program.

Buffalo Canadian Gold Mines is planning further exploration of its 50-claim base metal prospect in the Upsalquitch area this summer. Earlier this year a 600-ft anomaly was indicated by geophysical work. Property is located about 45 miles northwest of Bathurst.

Sturgeon River Mines is making good progress in underground work at its silver-lead-zinc property, located some 15 miles northwest of Bathurst. Drifting east on both the 200 and 500-ft levels are now in ore and results are up to those obtained in surface drilling.

Zone, now being opened, known as the Original shaft showing, was indicated in surface diamond drilling for a length of 780 ft with average of 4.68 oz Ag, 2.82% Pb and 4.18% Zn across a width of 8.6 ft.

Another zone, the Hachey, which is located 700-800 ft to the west, was indicated for a length of 150 ft and width of 19.8 ft. Average grade was calculated at 7.23 oz Ag, 1.59% Pb and 2.14% Zn.

ONTARIO

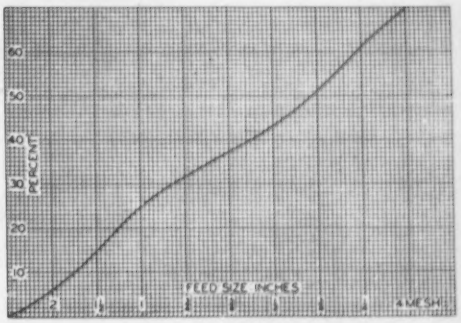
oduction has started at the Coldstream Copper Mines' property near Kashabowie, some 70 miles west of Port Arthur. Initial operations are to be maintained at 500-600 tpd. It is expected that the concentrator will be brought up to capacity of 1,000 tpd in about four months. Ore reserves at the property have been estimated at 1,931,000 tons, 2.51% Cu.

see what Marcy can do for YOU!

...to increase tonnage at lower cost with 2-STAGE GRINDING

Mine and Smelter has specialized in the design, manufacture and application of Marcy Mills since 1915. The extensive research and experience during this time has resulted in many refinements in the grinding process. One of the most significant developments is 2-stage grinding.

Operating experience has proved that use of Marcy Open End Rod Mills for 2-stage grinding will increase tonnage at lower overall cost per ton.



This graph shows increase in mill capacity with decrease in size of feed. For example if a rod mill was used to decrease ball mill feed from 1" to 4 mesh the ball mill capacity would be increased 45%.

Experience has proved
two successful ways of using Marcy Open End Rod Mills for 2-stage grinding...

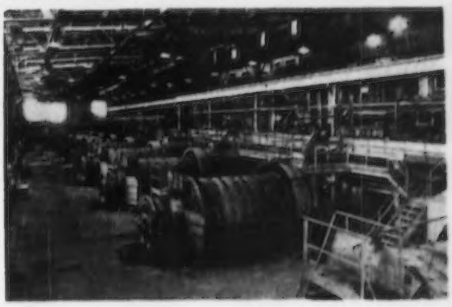
1 By addition of a grinding stage

Adding Marcy Open End Rod Mills between existing crushing and grinding circuits...

- Permits larger size crusher discharge, thus greatly increases crushing capacity
- Rod mill can take 1" feed and produce a higher percentage of finished product than crusher
- Rod mill provides finer feed for ball mills, increasing their capacity
- Permits recovery of liberated mineral at coarser size

2 By replacing fine crushing

Replacing fine crushing with Marcy Open End Rod Mills gives all the advantages listed under No. 1, in addition to eliminating the high operating and maintenance costs of complex circuits of crushers, rolls, screens, elevators, etc.



This large copper company installed a 9½' x 12' Marcy Open End Rod Mill in parallel with its 2-stage roll-screen circuit. As a result of this test 17 Marcy Rod Mills were installed to replace all roll-screen circuits. Rod Mill feed is 1½" hard ore; grind is to 4% + 10 mesh; tonnage up to 2700 tons per day, each mill. They reduced costs and improved operating conditions.

FOR ACTUAL OPERATING DATA ON 2-STAGE GRINDING WRITE, WIRE OR CALL . . .

NO EXTRA CHARGE FOR MARCY® EXPERIENCE

THE MINE AND SMELTER SUPPLY CO.

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SALES AGENTS AND LICENSED MANUFACTURERS THROUGHOUT THE WORLD

MACKS earn more . . . get more done . . . because
PART FOR PART, MACK TRUCKS ARE THE BEST BUILT

take the Mack Transmissions!

Only Macks have Mack-built transmissions. They're the finest units made, manufactured to standards no other automotive maker approaches. There's one for every trucking requirement—from four- to twenty-speed. And all are built for almost unbelievable endurance under maximum loads.

Only Macks have them . . . as only Mack trucks have the incomparable Mack engines, axles, cabs and frames. In fact, no other truck is *built* like a Mack, stands up like a Mack, or has the low-upkeep, high-performance, *higher* earning power of a Mack. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

4693-A

The exclusive, Mack-built, 20-speed Quadruplex, shown with gears and shafts.

HERE'S WHAT MAKES MACK TRANSMISSIONS THE WORLD'S FINEST

- To make sure that Mack transmissions are untouched for strength and endurance, the exclusive Mack tetrapoid gears are drop forged, generator cut and case hardened.
- To give your drivers effortless, smoothly paced control through all speeds, Mack makes transmissions with closely spaced ratios and constant mesh, helical gearing.
- To make sure that every drop of fuel pays off in productive pulling power, Mack can give you gear ratios in regular progression through all speeds.
- To hold maintenance and upkeep expenses to a minimum, Mack provides transmissions with pressure lubrication of bushed bearings and with magnetic plugs.
- To assure long-lasting, stress- and vibration-free operation, Mack transmissions are designed to work in harmony with all other Mack components.

LIMA

There's a quality-built LIMA to fit every mining job

You get down to pay dirt faster when you have power-packed Limas digging for you. Limas are rugged machines designed to master the toughest digging jobs . . . they strip away overburden fast in big, profitable bites . . . they get coal and ore loaded fast. Built in sizes from ½ to 6-cu. yds., there is a Lima matched to your mining operation.

These quality features are built into job-matched Limas!

air-controlled clutches on the larger types for ease of control and instant response.

anti-friction bearings in the drums and other critical parts to keep wear at a minimum and lessen lubrication problems.

dirt seals and retainers in crawlers exclude abrasive material.

torque converter drive (optional) for greater power without stalling.

big-capacity drums for longer cable life.

And, remember, wherever you are, you can depend on skilled service and nearby service stocks of parts to keep downtime to a minimum. See your Lima distributor for complete information about the machine best fitted to your needs . . . or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

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Construction Equipment Division — LIMA WORKS

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Lima Type 34 Paymaster Dragline working in lead and zinc tailings near Wallace, Idaho. Machine has 45-ft. boom.

Lima Type 1201 Shovel stripping overburden in iron ore operation near Kinney, Minn. Machine is equipped with 32½-ft. boom, 22-ft. dipper handle, and 3-cu. yd. dipper.

Lima Type 2400 High Lift Shovel with 60-ft. boom, 45-ft. dipper handle, and 4½-cu. yd. dipper, mining coal near Holloway, Ohio.

SIMPLICITY

screening methods for mines

INFORMATION ON ORE PROCESSING EQUIPMENT

189

HANDLING HIGH GRADE ORE AT CLEVELAND CLIFFS IRON COMPANY ISHPEMING MINE

Ishpeming, Mich.—SIMPLICITY heavy duty vibrating feeders and scalpers at the Cliffs Shaft Mine of the Cleveland-Cliffs Iron Company handle 350 tons per hour of high grade iron ore.

The first step in the process involves a SIMPLICITY MA-4 6′ x 16′ HD feeder, which takes the crude ore from the ore passes, then feeds it to an M-15 Simpli-Flo 6′ x 12′ scalping screen. The ore fines pass through the scalper deck onto the 5′ x 20′ and 5′ x 21′ MA-4 feeders. These feeders, set in tandem, relieve the primary crusher of fines.

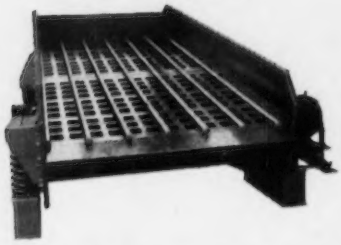
Oversize ore now passes off the scalper deck onto the 6′ x 20′ picking table, where rock and other foreign materials are removed.

Next, the picking table feeds the ore to a 42″ x 48″ jaw crusher which discharges onto the 5″ x 41′ tandem feeder. This, in turn, feeds the iron ore to a 6′ x 12′ SIMPLICITY M-15 scalping screen, where the over-size ore goes to a 4¼′ cone crusher, and then to the skip loading pocket. Fines pass through the screen deck directly to the skip pockets, relieving the flow of fines to the cone crusher.

Two 13-ton capacity skips now hoist the ore to the headframe above ground level, discharging into a bin which is above the SIMPLICITY MA-4 feeder, from which an even flow of material feeds to a belt conveyor. In the final step, the conveyor feeds the ore to the 5′ x 12′ double-check SIMPLICITY M-15 scalper, which classifies the processed ore into separate bins for loading into ore cars.

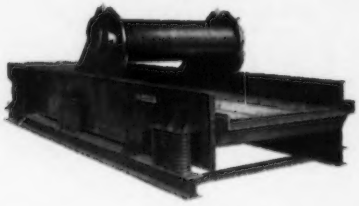
SIMPLICITY ore processing equipment is speeding ore production and reducing unit costs for the Cleveland-Cliffs Iron Company. It can do the same for you.

430 TONS TACONITE SCALPED PER HOUR



Lumps of hard, tough, extremely abrasive Taconite iron ore are scalped by this SIMPLICITY 6′ x 12′ model M-15, where it is used as both a primary and a secondary scalping unit. One plant using this equipment is operating their rugged SIMPLICITY machines 24 hours a day, seven days a week, with extremely negligible down time . . . proof of SIMPLICITY's careful design and superior construction.

QUICK-CHANGE SHAFT ASSEMBLY ON 6′x 20′ SCREEN



Big 6′ x 20′ SIMPLICITY Horizontal Screens like this one are working daily in all phases of the mining industry, such as in dewatering and "sink float" ore separation operations. In these big SIMPLICITY 6′ x 20′ units (which were the first screens of this size put into successful operation), complete shaft assemblies can be changed in just 30 minutes' time.

Write for information on any of these pieces of equipment

SIMPLICITY ENGINEERING COMPANY

DURAND 4, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A. • FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario • FOR EXPORT: Brown and Sites, 50 Church St., New York 7, N. Y.

At Steep Rock Lake, Ontario, dredge pumps lined with Lukens "T-1" steel (321 min. Brinell) remove two million cu. yds. per month.

Rock, Gravel Crash Through World's Most Powerful Dredges; Lukens "T-1" Steel Adds 33% to Liner Life!

TRADEMARK

Dewatering of this Canadian lake by Caland Ore Company, Ltd., will permit open-pit mining of hematite ore.

In dredging operations, impact and abrasion combine with brutal force to give pump liners expensive beatings. In the world's most powerful dredges, Lukens "T-1" steel now slashes this expense for Construction Aggregates Corp., agents for Caland Ore Co., Ltd.

With order after order, Lukens "T-1" steel is lasting 33% longer than the abrasion resistant steel formerly used.

Whether you handle stone, coal, or metal ores, Lukens "T-1" steel used in the areas hardest hit by punishing abrasive impact will save you money, too. It has tripled the life of rock driers. The 321 minimum Brinell quality has been known to outlast previous metals by 18 to 1 in quarry wear plates. Chutes, hoppers, and mine cars are other typical applications.

And Lukens "T-1" steel retains its remarkable combination of hardness and toughness at temperatures well below zero. Send for our informative, illustrated booklet, "Lukens 'T-1' Steel." Write Manager, Marketing Service, Room 958, Lukens Steel Company, Coatesville, Pennsylvania.

LUKENS

Helping industry choose steels that fit the job

Free World Gold Production

(Millions of U. S. dollars—$35 per oz base)

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956 (est.)
Total	$756.5	$805.0	$840.0	$864.5	$840.0	$868.0	$864.5	$913.5	$959.0	$988.0
Union of South Africa	392.0	405.5	409.7	408.2	403.1	413.7	417.9	462.4	510.7	556.0
Canada	107.5	123.5	144.2	155.4	153.7	156.5	142.4	152.8	159.1	153.9
U. S. A.	75.8	70.9	67.3	80.1	66.3	67.4	69.0	65.1	65.7	64.3
All Other Countries	181.2	205.1	218.8	220.8	216.9	230.4	235.2	233.2	223.5	213.8

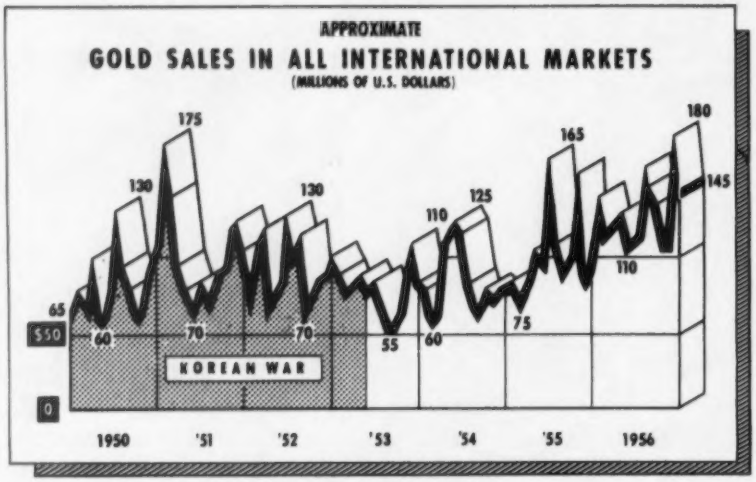
International Trade in Gold Is Seen Increasing

LIBERTY of gold ownership continued to increase in 1956, says Franz Pick, publisher of the *1957 Pick's World Currency Yearbook*, which is to be published early this month. In his annual survey of the international gold situation, Mr. Pick points out that Belgium and Luxembourg freed their gold trade Jan. 1, 1956 and returned to full private transferability of the metal in any form. Private imports of gold in Greece were authorized Jan. 12 and, on March 21, the Canadian government restored full private freedom of gold transferability.

Beginning March 1, 1957, Western Germany, which had already freed ownership of gold coins in 1955, authorized free import of gold bars from all European Payments Union countries, which included Switzerland. Trading of bars within Germany also was legalized, but exports of the metal remained subject to license. Morocco freed imports at the end of March 1957.

The U. S. gold position, according to Pick, "varied little during 1956. In spite of possessing the world's largest gold holdings of $22.1-billion, the U. S. is unable to consider this amount as clean monetary assets," due to its being "mortgaged" by at least $8-billion of foreign government deposits in America, which are convertible "at a moment's notice into the yellow metal."

USSR sold about $150-million in gold in 1956 and was forced to supply her satellites with additional hard currency funds early in 1957. Following the bloody uprisings in Hungary, Pick says, Moscow shipped another $180-million to Western Europe, and is expected to export more during this year. Russia's gold stock was estimated at about $7.6-billion at the end of 1956.



Hoarding of gold increased substantially during the Suez crisis of October and November 1956, but quieted down again in early 1957. Another surge occurred in March in Near East and South Asia centers, but supply was such that no major price movements were noticed. Total gold hoards in the year ending October 1956 were 4½% over the corresponding 1955 period.

Prices on the London market, says Pick, "moved within the narrowest limits in 1956 and early 1957." Free market prices of bar gold came near and sometimes even slightly below the official rate of $35 per oz in principal western trading centers, but higher prices in Hong Kong, Bangkok, Shanghai and Bombay often went much higher, with the latter hitting $57 per oz in March 1957.

Coins rose to $44 in leading European centers, near $40 in the U. S., $45 in ffast Asia and $57.50 per oz in the trading center at Bombay.

Ontario *(Continued)*

Mill expansion program now in progress at Macassa Mines, Kirkland Lake gold producer, is expected to be completed by November. Mill capacity is being upped from the present rate of 400 to 500 tdp. Development work during the past year has added considerably to ore reserves. These were increased from 437,830 tons at the beginnig of 1956 to an estimated 833,167 tons at the start of the current year. Grade moved up from 0.42 to 0.46 oz gold per ton.

Construction is under way at the Moose Mountain iron property of Lowphos Ore Ltd. in preparation for production next spring. Some 20 to 25-million tons grading 30 to 32% iron, available from open pit have been indicated. Annual production is expected to be about 500,000 to 550,000 tons of concentrate. Property, located 35 miles north of Sudbury, is serviced by a 4.5-mile C.N.R. spur line from Milnet.

Sand River Gold Mining Co. is carrying out diamond drilling to test a large anomaly indicated by an airborne magnetometer survey on its iron prospect at Kabinakagami Lake in the Michipicoten area, north of Sault Ste. Marie. Massive and semi-massive magnetite has been intersected over good widths. Indicated length of the anomaly is 3,000 ft with widths up to 1,500 ft.

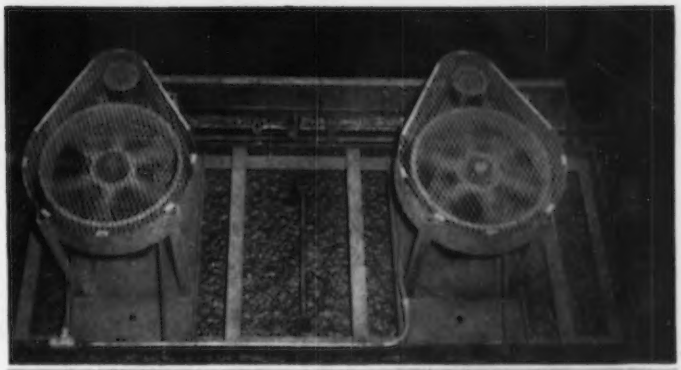
Roche Mines cut the best intersection to date in its recently completed fifth diamond drill hole at its Blind River area property. Hole, completed to depth of 1,929 ft, cut an 18-ft section of quartz pebble conglomerate, of which 10 ft from 1,892-1,902 ft assayed 0.08% uranium oxide.

QUEBEC

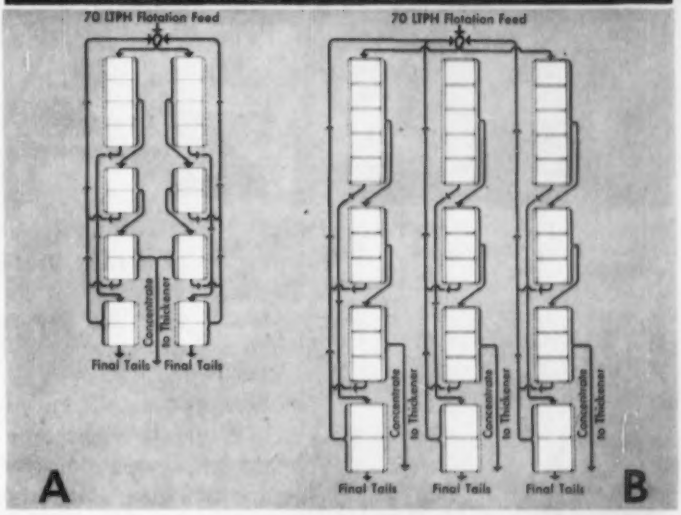
A large scale staking rush has developed in the Bell River-Mattagami Lake district, about 90 miles north of Senneterre. Rush followed a promising copper-zinc find by Mattagami Syndicate. Latter is composed of six companies, Leitch Gold Mines, Teck-Hughes, Dome Mines, Iso Uranium Mines, Highland-Bell and Area Mines, each holding a 16.66% interest. In the first hole put down by the Syndicate, two intersections were ob-

WEMCO

Fagergren Flotation 8 ways better!



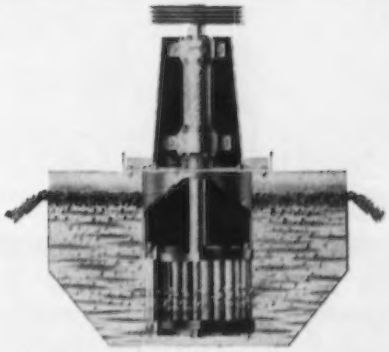
here's the proof: In an efficient new iron flotation concentrator, two parallel flotation circuits are used. Each receives identical feed, and each handles 70 long tons per hour with grade meeting market requirements. Check and compare these facts:



		Wemco Fagergren Units A	Other Flotation Units B
Circuit Characteristics	✓ Number of Cells	20	39
	✓ Gross Cell Volume[1]	1220 cu. ft.	2400 cu. ft.
	✓ Floor space (all cells)	644 sq. ft.	988 sq. ft.
	✓ Launder & Operating aisles (approx.)	167 sq. ft.	261 sq. ft.
	✓ Total Launder Length (approx.)[2]	225 ft.	375 ft.
Typical Metallurgical Results on This Type of Iron	✓ Units of Iron Recovered	1%-2% more	
	✓ Tailings Loss	1%-2% less	
	✓ Reagent Consumption	.2-.3 lbs. less per ton treated	

Notes: 1 – Taggart, Section 12 page 80, shows WEMCO-Fagergren efficiency of cell volume substantially greater than others, in addition to the above noted advantage in space alone.

2 – Shorter launder length in WEMCO circuit allows steeper slope; requires less wash water, causing less dilution of concentrate and minimizing dewatering requirements.



A reprint of the complete story is available for the asking. Write to:

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WESTERN MACHINERY COMPANY
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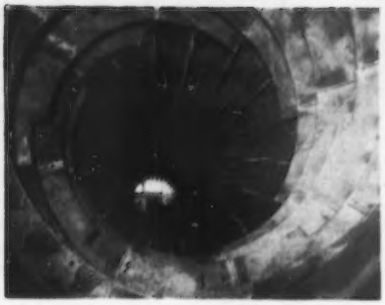
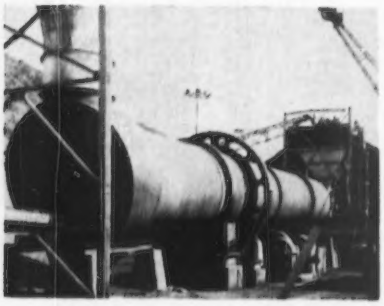
from **Alumina ores** to **Zircon concentrates**



Interior of shell of "XH" Ruggles-Coles Dryer showing lifting flights and feed spirals.

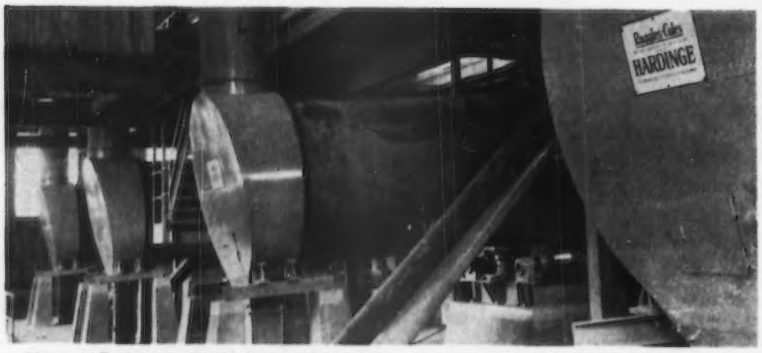


10′ diameter, 80′ long "XH" Ruggles-Coles Dryer drying bauxite in Jamaica.

. . . in the drying of ores and concentrates. That is the story of Ruggles-Coles "XH" Dryers.

Small or large, each dryer is designed for the specific requirements of the user with the knowledge and experience gained from hundreds of installations.

Complete specifications upon request. Ruggles-Coles Dryers are described in Bulletin AH–438-1.



Four 80″ diameter, 60′ long "XH" Ruggles-Coles Dryers handling asbestos ore in Canada.

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Quebec (*Continued*)

tained, one of 27 ft assaying 0.89% Cu, 6.6-Zn, 0.03 oz Au and 0.58 oz Ag, the other of 88.5 ft assaying 0.83% Cu, 8.89% Zn, 0.02 oz Au and 0.6 oz Ag.

Bateman Bay Mining Co. has decided to sink a shaft on its copper prospect in the Chibougamau area. Shaft, which is to go to 530-ft, is to be put down on the "A" zone. From work indicated to depth, this zone is indicated to contain 1,000 tons per vertical foot to 500-ft depth with grade of 2.11% Cu, 0.084 oz Au and 0.43 oz Ag per ton. Two other zones, the "B" and "C", will be tested by diamond drilling from the underground workings.

Considerable staking has been carried out in the Val d'Or-Malartic area following a promising nickel discovery. Surface outcrop was exposed for a length of 75 ft, open at both ends, with width of more than 10 ft. Surface sampling gave values of up to 3.1% Ni. The 30-claim discovery property was taken over by Marchant Mining Co, controlled by Peruvian Oils and Minerals.

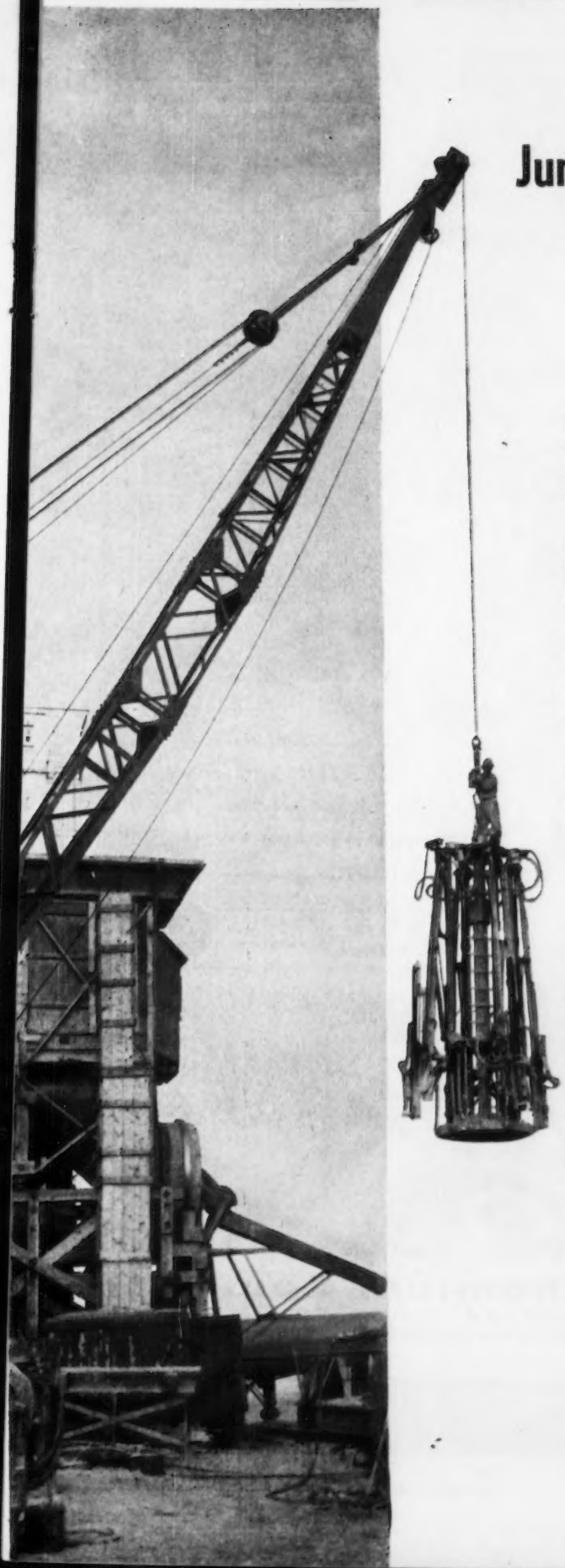
Deep diamond drilling is planned by Oka Rare Metals on its property in the Oka district, located some 40 miles west of Montreal. Previous diamond drilling indicated a columbium-rare earth deposit of 200,000 tons to depth of 300 ft. In 1956, a shaft was sunk to 300 ft and two levels opened at 150 and 275 ft. Some 550 ft of drifting and crosscutting and 1,000 ft of underground drilling were carried out. Values were intersected on both levels.

Quebec Chibougamau Goldfields is planning to start construction of a 1,000-ton mill at its Chibougamau area copper-gold property next September. Drifting is currently in progress on the 350-ft and 650 ft levels. In all five levels have been established at 150-ft intervals from 200 to 800 ft. Indicated tonnage in the main "A" zone has been estimated at 1,300,000 tons averaging 0.097 oz Au, 0.88 oz Ag per ton, and 1.2% Cu.

Chib-Kayrand Copper Mines is carrying out further diamond drilling on its copper prospect in the Chibougamau area to test a strong shear zone. It is planned to test the zone along a length of 2,000 ft at deep horizons. Low values in copper were obtained in earlier drilling on the zone.

O'Leary Malartic Mines has started diamond drilling on its copper-gold prospect at Auger Lake in the Bachelor Lake district. Program is designed to test a showing of copper-gold in a broad shear zone which cuts across the property. A strong structure, well mineralized with pyrite and chalcopyrite, has been indicated in preliminary results.

Recent work at the Duvan Copper Co. copper property in Desmeloizes township has been concentrated on opening the four bottom levels to develop downward extension of the structure previously opened on the four upper levels. Levels are at 575, 700, 825 and 950 ft. Preliminary estimate of the deposit from



Jumbo Sinks 18 Foot Diameter Shaft 10 Feet per Day!

Le Roi multiple drill rig speeds Wyoming mine project

"Only this Le Roi jumbo rig could make this kind of progress." That's the opinion of experienced mining engineers at the site of a new mine shaft near Green River, Wyoming.

Their job was to drive an 18 foot diameter ventilating shaft 1600 feet straight down through hard Wyoming rock. They did it in record time with a Le Roi Shaft Jumbo.

Le Roi's Shaft Jumbo is a self-leveling multiple drill rig. It has four extendible arms, each mounting a heavy sinker drill on an independently controlled 2-to-1 air-feed shell. Each arm is mechanically positioned by air motors.

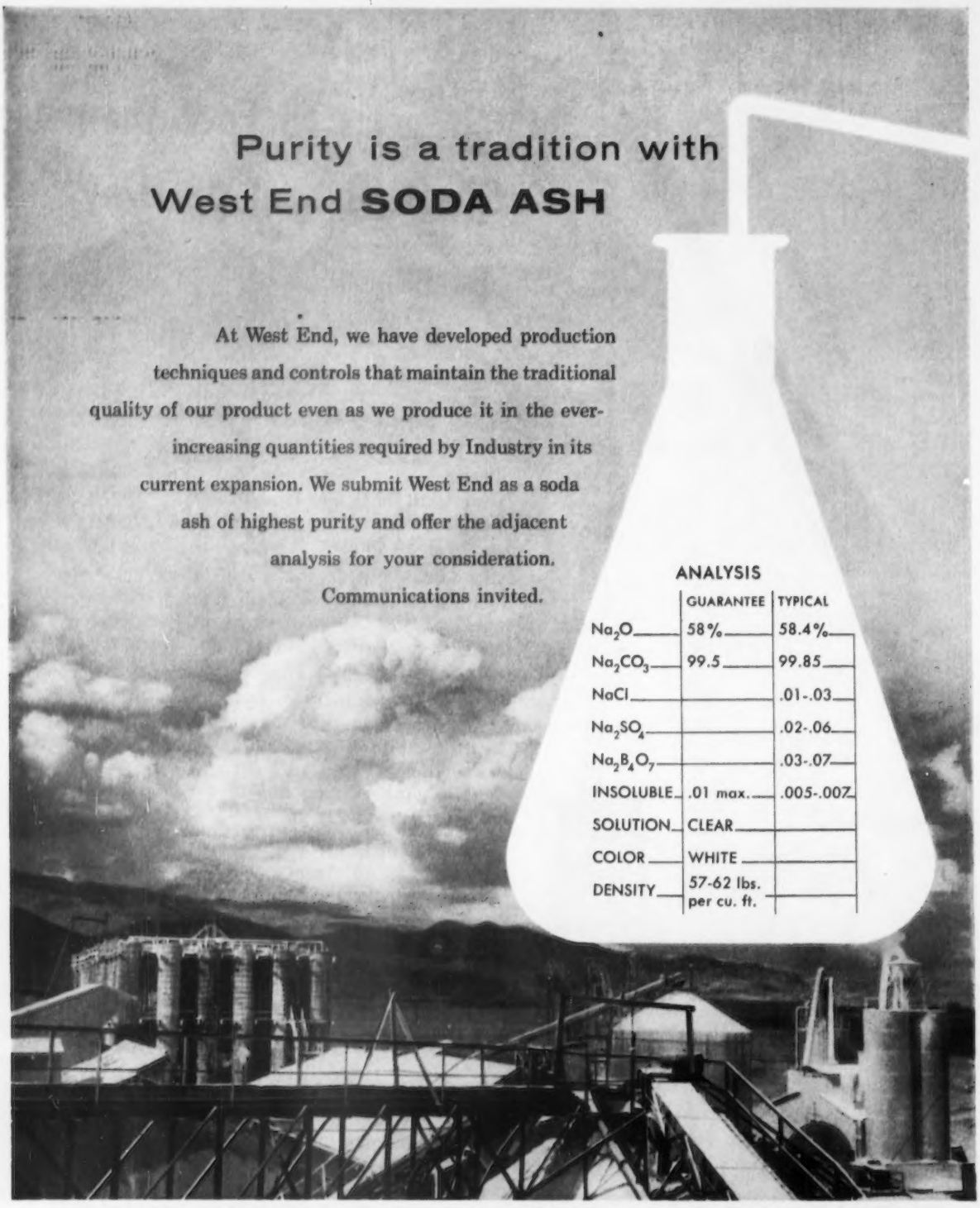
On the Wyoming job, each round in the hard formations required 65 holes drilled to an average depth of 12 feet. The drilling pattern included a row of holes spotted around the perimeter, with successive inner circles offset for maximum shattering and fragmentation.

Each complete drilling sequence was finished by the Jumbo in an average of 3 hours. By using the feed shells, instead of hand-held jackhammers, steel changing was eliminated. On a 65-hole round, 12 feet deep, time saved was considerable . . . and multiplied by the shaft depth, amounted to real money!

In addition, drilling was much more accurate using the positive feed, air-motor positioned drills. This meant more accurate patterns. Worker efficiency increased, too. Easily controlled feeding eliminated the big source of worker fatigue.

The Le Roi Shaft Jumbo can drill shafts from a minimum diameter of 11′-9″ up to a maximum diameter of 28′-0″, and shafts have been sunk with the Jumbo to a depth of 3,000 feet. Normally equipped with 4 drills, the Jumbo can be furnished with 2 or 6, if desired. It is also available with dust collectors. For complete information, contact your local Le Roi distributor, or write us direct.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.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West End SODA ASH
At West End, we have developed production techniques and controls that maintain the traditional quality of our product even as we produce it in the ever-increasing quantities required by Industry in its current expansion. We submit West End as a soda ash of highest purity and offer the adjacent analysis for your consideration.
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GUARANTEE
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Na_2O 58% 58.4%
Na_2CO_3 99.5 99.85
NaCl .01-.03
Na_2SO_4 .02-.06
$Na_2B_4O_7$ .03-.07
INSOLUBLE .01 max. .005-.007
SOLUTION CLEAR
COLOR WHITE
DENSITY 57-62 lbs. per cu. ft.

WEST END

West End Chemical Company

DIVISION OF STAUFFER CHEMICAL COMPANY

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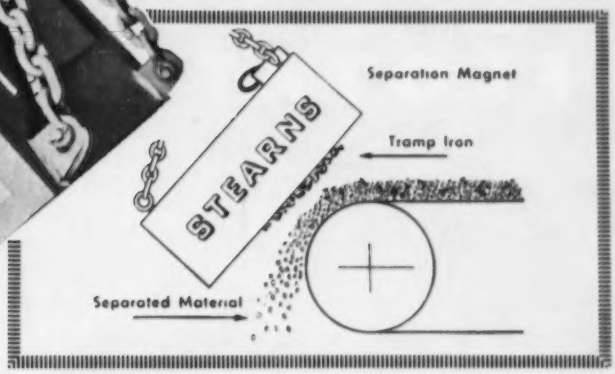
SODA ASH • BORAX • SODIUM SULFATE • SALT CAKE • HYDRATED LIME

STEARNS SUSPENDED MAGNET

gives you cleaner ore —even on fast conveyors!

Magnet can be suspended at head pulley of conveyor, in position shown, or anywhere along the belt. At right, principle of operation of Stearns rectangular suspended magnet. Optional cable suspension for easier control of angle.



A Stearns rectangular suspended magnet gives you positive and efficient removal of tramp iron — even on heavily loaded, fast conveyor lines.

The Stearns rectangular magnet design permits its powerful, deep-penetrating magnetic force to remove tramp iron effectively from entire width and depth of material burden at belt speeds in excess of 600 fpm. The magnet operates efficiently where other equipment can't do the job.

Greater Flexibility

Stearns suspended magnets overcome space limitations because they can be placed over head pulleys or anywhere along the belt. Some are installed to remove tramp iron before material moves onto the conveyor—thus safeguarding the belt and other processing equipment from damage.

Stearns suspended magnets are economical to install and operate. There's no need to modify your existing conveyor systems.

Standard or Custom-Built

Magnetic specialists at Stearns design and build rectangular or circular suspended magnets, electro or permanent magnetic pulleys in standard sizes — or to your specifications. Get complete details from your Stearns representative.

Check these advantages:

- *All-welded, moisture-proof construction*
- *No moving parts that require replacement*
- *Single-coil construction for magnetic field stability*
- *New design of magnet coil enclosure affords maximum heat dissipation*
- *Vacuum-impregnated windings for long life, dependable operation*

FREE BULLETIN AIDS SELECTION

Send today for new bulletin describing five major types of Stearns suspended separation magnets. Gives you complete specifications and simple method of selecting the proper size and type of magnet for your application. Ask for Bulletin 1031-D

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY • VALPARAISO, INDIANA

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Quebec *(Continued)*

surface to the 450-ft level is given as 103,000 tons grading 2.93% Cu.

MANITOBA

Starratt Nickel Mines reports that an overall exploration program is to be carried out on its group of 900 claims in the Thompson-Moak Lake area. Drilling has already commenced on ground where anomalies were indicated in geophysical surveying. Program of detailed investigation is under Sulmac Exploration.

Cove Uranium Mines reports encouraging indications were obtained from geophysical surveys made on its holdings comprising 98 claims, in the Cuthbert Lake area. Further work is being carried out.

Francoeur Mines reports that the company has carried out magnetometer and electromagnetic surveys on its 54 claim group in the Reed Lake Area. Drilling and surface trenching program is to be carried out this summer. Two preliminary drill holes have indicated low values in nickel and copper.

Silanco Mining and Refining Co. plans to reorganize and carry out exploration and diamond drilling on holdings in the Wintering Lake and the Thompson-Moak Lake areas. Company has acquired over 100 claims.

BRITISH COLUMBIA

Woodgreen Copper Mines is treating 1,000 tpd now that the tune-up period is over. Currently the company is stepping up the milling to 1,200 tpd. Last report said 1,450 tons of copper concentrates had been shipped but there was no mention of the grade.

Giant Mascot Mines Ltd. closed down its Spillamacheen lead-zinc mine in June, but a 10-man diamond drilling crew has been left to continue exploration work. Giant is seeking a new property and is reported to be looking at two or three.

In its six years of operation, Giant Mascot produced some $10-million worth of lead, and was B.C.'s third lead producer in size. It also produced a quantity of zinc.

Western Nickel Mines Ltd. (50% of shares owned by Newmont Mining Corp. and 49% by Pacific Nickel) plans an initial production rate of 400 tpd.

Last April saw the start of reopening the mine workings near Choate. Granby Consolidated Mining, Smelting & Power Co. has been engaged to manage mine operations.

Western reports that contracts for sale of substantial quantities of nickel for delivery to European buyers to 1960 have been completed.

Bethlehem Copper Corp. is pressing ahead with exploration and development work, in spite of currently depressed copper prices. American Smelting Refining has five drills operating, compared to three a year ago and 10 shifts of men working compared to five a year ago.

So far, 100-million tons of ore, proven or strongly indicated, have been found on the Iona and Jersey zones and the company is confident it has a profitable mining and milling operation.

Total of 30-million tons on the Jersey zone have been separated out as a unified mineable block that will grade about 0.8% cu. Incomplete results from holes now in the process of drilling suggest that in the near future the indicated reserves of the Jersey zone will be substantially increased.

SASKATCHEWAN

Claim staking in the 170-mile long chalcopyrite belt between La Ronge and Flin Flon rivals the early uranium rush days—but with a difference.

More than 1100 prospectors involving up to 50 companies are using aircraft, coded radio messages and new electronically computed maps to launch western Canada's biggest scramble in years for hot mineral areas.

Unconfirmed reports state that the focal point for claim staking is in the Wappaweeka Lake area 75 miles east and

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For more than fifty years TRIANGLE BRAND COPPER SULPHATE has been the accepted activator for the removal of sphalerite from lead-zinc ores. It is 99% + pure and available in several sizes to meet your requirements.
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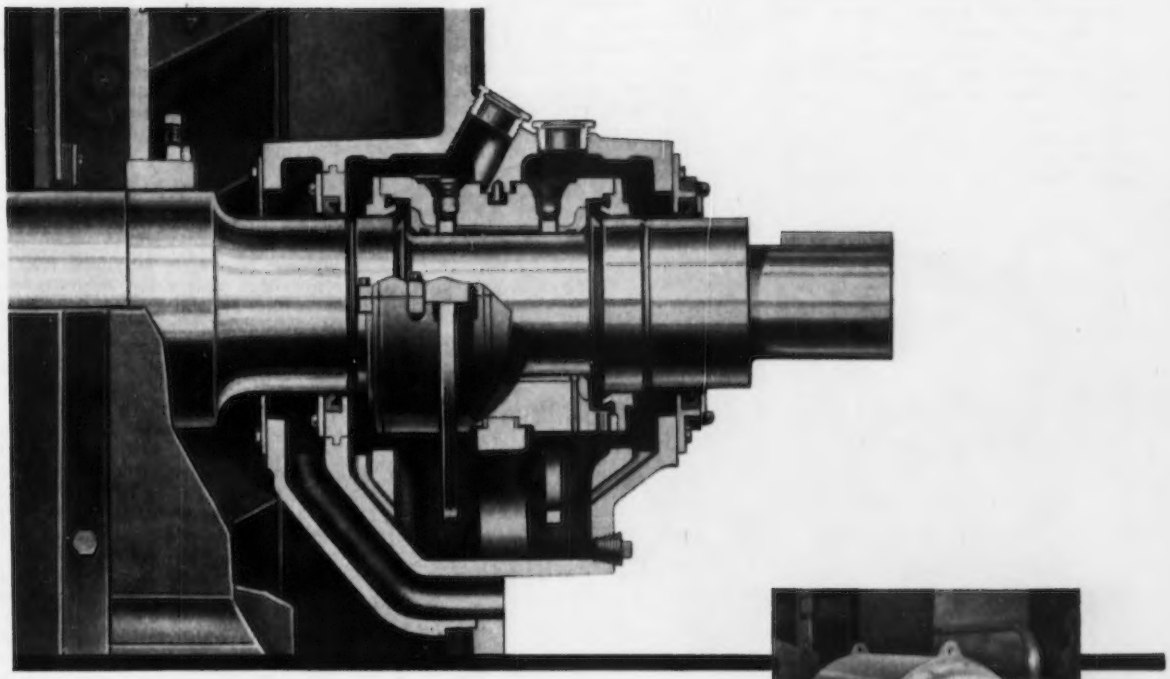

Motor Bearing is pressure-equalized with vent

Driving a copper rod rolling mill.

SHAFT seals and a pressure-equalizing vent give double protection against oil leakage from this Allis-Chalmers motor bearing. First, seals keep oil inside the enclosure. Second, the pressure-equalizing vent chamber maintains atmospheric pressure at the inboard side of the bearing, so that fan action won't pull oil vapors out of bearing, under any conditions. This double protection assures oil-free motor interior and drip-free operation.

Accessible, Too!

Motor inspection is easy with capsule-type bearing housings. Upper halves of motor end shield and inner air baffle can be removed without opening the bearing enclosure or disturbing bearing alignment.

For details on these and other features of Allis-Chalmers motors, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5474

Saskatchewan (*Continued*)

slightly north of La Ronge in north central Saskatchewan.

But the search is also ranging throughout the 1700 sq mile belt of copper bearing mineralization running east from Waden Bay and taking in chunks of promising areas around Hanson and Deschambault Lakes.

Estimates of staking volume suggest that upwards of 4000 new claims will be recorded before the middle of August.

Claim staking began building up in June as companies moved into the area and set up base and supply camps to avoid being left behind. Scramble shifted into high gear when the Saskatchewan government released 18 maps based on newly-completed airborne magnetometer and electro-magnetic surveys—the first to be done for a government in Canada.

"The result is a staking rush unlike anything we have had in the past," said Regina investment dealer Gordon Tanner reporting from La Ronge. "I have talked with several engineers who tell me the results of the airborne survey are excellent."

The surveys were carried out for the Department of Mineral Resources by Canadian Aero-Services Limited and Aero-Magnetic Surveys, Ltd. They cover all, or portions, of Forbes Lake, Settee Lake, Guncoat Bay, Nistowiak Lake, Hunter Bay, Cartier Lake and Oskikebuk Lake.

As quickly as the maps were released, engineers and geologists began to interpret them. Within minutes the first aircraft had left the seaplane docks at La Ronge with the first staking party.

Others, with aircraft waiting and engines turning over, rushed to the build- of the Department of Natural Resources to radio coded instructions to prospectors ready to move in and start staking.

● Performance experience clearly shows the utter dependability and efficiency of custom designed Connellsville Rotary Car Dumpers. Users are familiar and pleased with their sturdy build, low upkeep and long life.

● Available in the complete revolution type or the 180° and return type, Connellsville Dumps are friction, traction, rope, chain or gear driven.

● All units are counterweighted in proportion to the car and live load to be handled. This feature, by introducing a "free" assist in returning the empty car to an upright position, reduces horsepower requirements and cuts power costs.

● Interlocking arrangement between the Dump controls and car hauls permits complete control of the loaded cars at all times.

● Speedy 10 second dumping cycle is set in motion automatically or by push button with cars coupled or uncoupled.

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IN AUSTRALIA

Japanese buyers are increasing their already large orders for Australian-produced ilmenite and are currently discussing contracts running well into 1959. Western Australian ilmenite producers have described the long-term prices offered by Japanese buyers as "eminently satisfactory".

Japanese buyers have offered to sign for over 100,000 long tons for 1957/58 and additional enquiries have since been received. The Japanese were reported to be very satisfied with the quality of ilmenite aready received which was more than 54% titanium oxide. 1957 Japanese consumption is estimated by Australian suppliers at slightly in excess of 100,000 long tons. One company was interested in large quantities for processing into titanium steel.

Shipping arrangements are being made to lift the ordered ilmenite from Western Australian ports.

Japan has contracted to purchase iron ore from Western Australia and shipments worth about $2.5-million will take place in the near future.

Western Titanium N.L. has finally exercised an option to purchase additional areas totaling about 892 acres. Results obtained from the original testing of the new areas have been confirmed by check boring. Testing has disclosed 3,250,000 tons of heavy minerals in the higher grade section of the deposits and 3,537-000 tons in the lower grade section. Over the whole deposit, ilmenite content of the heavy mineral is 82.8% with the remainder comprising zircon, monazite and rutile. Heavy mineral reserves of this company are now in excess of 11-million tons and further expansion may be ordered if and when justified by the market for these minerals.

Consolidated Zinc is speeding up its activities on the bauxite deposit around Cape York and is studying the possibility of linking the bauxite field with New Guinea hydro power resources.

At the same time the company is investigating the abandoned Astrolabe copper field behind Port Moresby where ore reserves are thought to be in excess of 300,000 tons of relatively good grade. Copper was mined there until the outbreak of World War II when 100 white men and 1000 natives were employed.

Near Rum Jungle in the Northern Ter-

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Hydraulic cylinder provides 120° swing, can be indexed for an additional 90° swing.

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Hydraulic cylinder provides 90° dump, can be indexed a full 360°.

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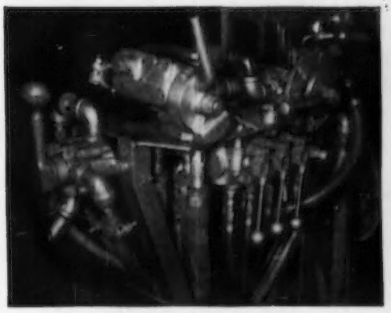
Twin hydraulic cylinders provide T-bar lift of 86° 30′, from below horizontal to nearly vertical.



New Remote Control Panel and Driver's Seat—centralized controls provide instantaneous control of swing, dump, T-bar lift, crawler tracks and all drilling operations. Designed for convenience, comfort and safety. Saves minutes and reduces operator fatigue.

New DPAT Hydraulic Drill Positioner —this creep-free hydraulic system maintains alignment at all drilling angles and avoids stuck steel. Provides fast, effortless, power positioning for all vertical, horizontal and flat lifter hole spotting.

New Model G-2 Bit Grinder—this deluxe "Air Trac" extra saves time, too. No need to send back or wait for bits —you sharpen spare bits on the job. Plus new free-wheeling drive shaft design for towing "Air Trac" . . . tool box for tools, bit and coupling storage.

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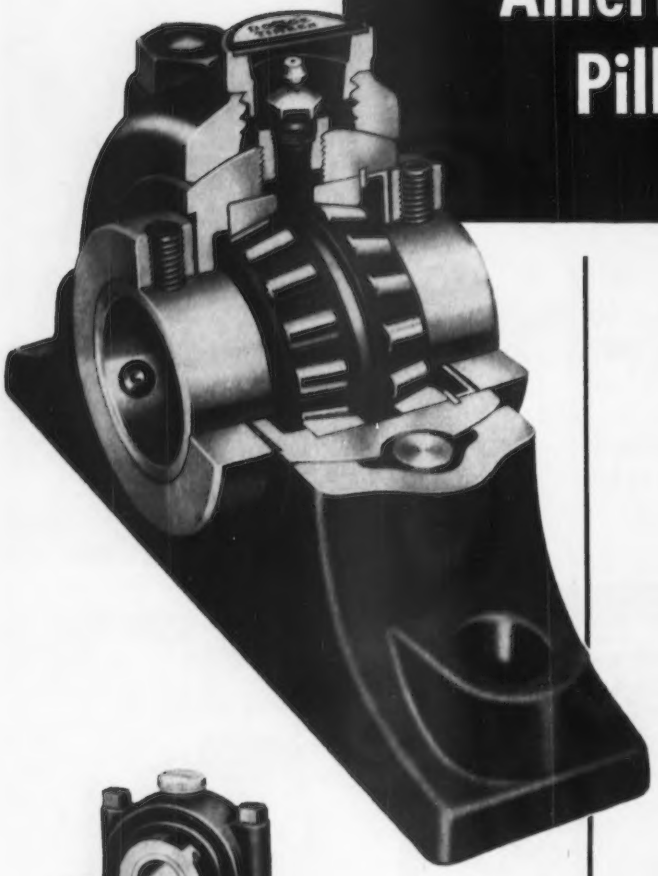

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Where service conditions are toughest Dodge-Timken Bearings prove their quality decisively. For superior performance, dependability and long life they have won their reputation throughout industry as America's quality pillow blocks.

To meet varying service requirements Dodge-Timken Pillow Blocks are available in five types—the type E..Double Interlock (illustrated)..Type C..Special Duty ...and All-Steel. Available in a range of shaft sizes from 1-3/16" to 10".

Call your Transmissioneer; or write for Bulletin A638 giving load ratings, dimensions and other data on Dodge-Timken Roller Bearings.

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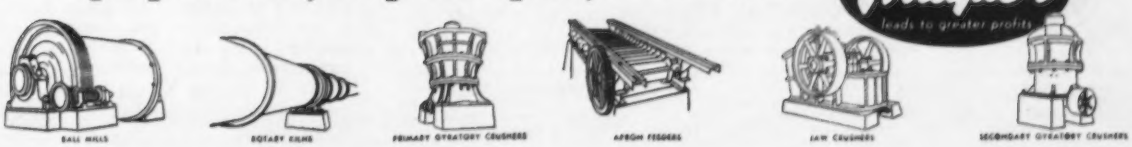

Australia *(Continued)*

ritory the company is currently testing a large low-grade lead ore field discovered by diamond drilling.

IN LATIN AMERICA

BOLIVIA

Patino Mines & Enterprises Cons., Inc. reports that during the first six months of 1957, it received $541,366 in accordance with a December, 1956 agreement with the Bolivian government. Agreement provides for payment of a certain percentage of the tin concentrate price as shipped from former Patino mines. This retention money is to be applied against indemnifications for the value of the properties nationalized—no final agreement has been reached.

MEXICO

Mexico has a uranium exploration program underway. Under the Comision Nacional de Energia Nuclear, exploration crews are combing the arid mountains of the States of Chihuahua and Sonora and the jungled mountains of the State of Oaxaca.

The Comision says that while samples containing radioactive minerals are constantly being received from its searching parties, no commercial deposits of uranium have as yet been found.

The historic silver mines in Pachuca, Hidalgo, which once supplied 70% of the world's silver, are getting a new lease on life. On behalf of the Comision Fomento Minero, a detached government agency, the Cia. Real del Monte y Pachuca, present operators of the mines, has begun preliminary construction of a mill to treat old tailings at 1500 tpm concentrate rate. Tailings accumulated over the years contain gold, silver and lead in some 50-million tons of material.

Tailings will be mined hydraulically, then floated for a sulphide concentrate, which will be sent to Cia Metalurgica Penoles smelter at Torreon.

Cananea Consolidated Copper Co., subsidiary of Anaconda Co., has petitioned the Mexican government for a fiscal agreement which would make commercially feasible a 10-year $20-million expansion program.

Cananea stresses that it would find the expansion program commercially attractive and possible only if the Mexican government agrees to grant Cananea a special reduction in production and export taxes which together now amount to about 30%.

Expansion program would involve raising its mill capacity from the present 15,000 to 22,000 tpd, boosting power plant capacity from 15,000 to 19,000 kw, adding a third reverberatory furnace to its smelter and developing two underground orebodies. In the expansion, mining largely would be shifted from glory hole to underground. Program is necessary to prolong the life of the operation and to help keep pace with Mexico's domestic copper demands. Development of the two underground orebodies would grant the operation a minimum of another 30 years of life. Present reserves are adequate for only another 8 to 10 years.

Compañia Minera Tisur, S. A., in which Republic Steel has a majority interest, is making progress slowly at its rutile operation in the State of Oaxaca.

Tisur has done underground development work and diamond drilling, has received a satisfactory ore dressing report from the Bureau of Mines at Duluth, and has completed construction of a 25-mile road linking the minesite with Puerto Angel. Mine site is located in extremely rugged mountainous terrain and there is a 1300 meter drop to the port over the 25-mile road.

A 1000 to 1500 tpd gravity concentration mill is planned. But actual mining is not expected to get underway for another year. And shipment of the concentrates, through the Panama Canal to the U. S. East Coast, will have to await considerable development work at Puerto Angel.

C. P. Acids IN NO-DEPOSIT — NO-RETURN "LAB-SIZE" BOTTLES!

Ideal Size! Optimum size and weight for convenient and safer handling, especially by women technicians and girl students.

Ready to Use! From stock room shelf to lab bench. No more time and trouble—and contamination hazard—in stock room transfers from bulk acid containers.

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Uniform, Convenient Size! Same size handy "no-return" bottle is used for all acids. Contents by weight are:

Sulfuric Acid	2 lbs.
Hydrochloric Acid	1¼ lbs.
Acetic Acid, Glacial	1 lb.
Ammonium Hydroxide	1 lb.

And for Added Convenience and Economy, these "no-deposit" bottles are packed 12 to a "throw-away" fibreboard case, eliminating all returns, record keeping and extra freight costs.

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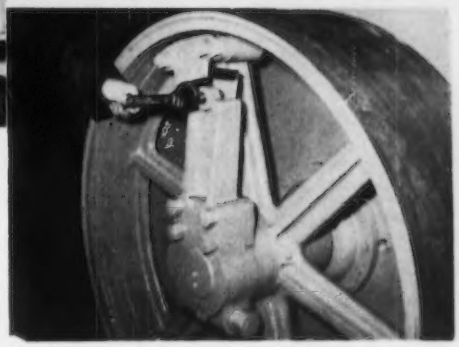
Lower cost per ton crushing follows immediately when you switch to a Kue-Ken Crusher. While operating at more crushing strokes per minute for greater capacity, Kue-Ken consumes less horsepower. A crankcase-type lubrication system and the elimination of rubbing between jaw plates provides this superior performance. Kue-Ken is the only crusher with sealed mechanism operating in a bath of clean, filtered oil with dirt and grit sealed out. Crusher runs cool under heaviest crushing conditions. "Crushing without rubbing" principle of Kue-Ken eliminates abrasion, the main cause of jaw plate wear. Kue-Ken jaw plates outlast those of conventional crushers at least 5 times saving replacement costs and downtime. Overload or tramp iron actuates safety device that instantly releases flywheel avoiding damage to crusher. High capacity Kue-Ken will give you the capacity you need with a smaller size crusher. Study the saving you can make in the chart below.



No damage on overload or tramp iron

Gone are the broken frames or toggles . . . the costly testimony to so-called safety toggles. Kue-Ken automatic control releases flywheel and permits it to run free without ratcheting. Crusher can be set to stop automatically on release of flywheel or to sound an alarm. On correction of overload or tramp iron, the flywheel can be quickly reset and the crusher put back into operation without costly delays.

Table of tons per hour that will pass through crusher with jaws set at dimension shown when measured in the closed position.

Table is based on crushing average hard, dry quartz or similar rock weighing at least 100 lbs. per cubic foot when crushed.

Kue-Ken crusher size	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"	Horsepower range
24" x 12"	22	26	32	36	43	50	56					15 to 30
30" x 12"	32	35	38	42	55	70	76	85	110			20 to 30
36" x 10"	38	47	57	67	80	91	105					25 to 40
36" x 20"					70	82	90	115	135	160		30 to 50
42" x 25"					90	120	150	165	180	215	250	40 to 60

WRITE FOR CATALOG

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CHILE

Paipote's reverberatory furnace has completed a 21 month campaign, the longest yet, before the arch had to be repaired. During this period the furnace has smelted 275,000 short tons of ores and concentrates.

The smelter is also starting its approved program to increase its capacity which will consist of building a new 105 x 30-ft reverberatory furnace with its waste-heat boiler and a new 250-ft high reinforced concrete stack; the installation of a 13 x 20-ft long converter with a new steam turbine driven blower plus an extra crane to serve the three converters.

NICARAGUA

Anastasio Somoza Debayle and Metalchimie (Germany) have agreed to exploit huge iron ore deposits in the Eastern Department of Zelaya in Nicaragua. The multi-million dollar operation would cover several thousand acres of ore-rich land near the east coast. Deal will be on a fifty-fifty basis between Metalchimie and Nicaraguan interests. Metalchimie will supply all the machinery and technical know-how. The ore will be exported.

Department of Mines and Hydrocarbons has released a report by its Italian geologist which points up large and economically exploitable deposits of minerals in the country. Report states that the most promising are iron, copper, antimony, gypsum, marble and diatomaceous earth. Estimates of 30-million tons of iron ore (64% iron) and 10-million tons of gypsum are made.

Interested companies have found that no mining rights are being extended by the Nicaraguan Government until such time as the National Congress approves a pending mining law which has been drawn up. Approval is expected this year.

Nicaragua's gold mining industry, which has been a source of income to the government, has dropped off. At present, there are only three gold mines in operation and in production. Output of 1956 amounted to 217,140 oz valued at $7,558,319, compared with 237,376 oz valued at $8,265,157 for 1955, and no improvement is expected for this year, according to government sources.

La Luz Mines, Ltd., Sinau, has announced that they have blocked for production next year, 4-million tons of 3% cu at Rosita.

GUATEMALA

Krupp of Germany is planning to exploit the rich iron ore deposits found on the black-sand beaches of Guatemala's Pacific coast. It is estimated that there are well over 30-million tons of high grade ore in a 200 kilometer beach that runs all the way to the Mexican border. The "beach-combing" operation would involve the use of electro-magnets to separate the ore from the sand.

M. A. Hanna Co. has applied for several mining concessions and is reportedly planning to invest around $2-million in a nickel mining operation. Most important concession is located in the Departments of Izabal and Alta Verapaz.

IN THE PHILIPPINES

Atlas Consolidated had its biggest month of the year in May. Tons milled totalled 258,840 in 23 working days, an average of 11,100 tpd. Concentrates produced were 5882 tons grading 26% Cu. Mill heads averaged 0.66% Cu. Total copper production was 3,006,063 pounds in the month. Company has announced that its $4.8-million acid and fertilizer plant will be completed by the year end.

It is reported that Samar Mining Co. has closed negotiations for the purchase of machinery and equipment for a copper refinery and smelter, and fertilizer plant to be erected in Iligan City. Plant is to process copper ores from the Elizalde mines in the Visayas and Mindanao.

Do these

MINE BIT SIZES OF BRUNNER & LAY INTRA-SET STEEL

give you ideas?

These Intra-Set advantages will . . .

1. High penetration speed
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⅞" x 4¼" Collared Shank			1" x 4¼" Collared Shank		
Mine Set Number	Length Under Collar	Bit Diameter Inches	Mine Set Number	Length Under Collar	Bit Diameter Inches
	2'7"	1 11/32		2'7"	1 27/64
	5'3"	1 5/16		5'3"	1 3/8
	7'10"	1 1/4	8 A	7'10"	1 11/32
7 A	10'6"	1 7/32		10'6"	1 19/64
	13'1"	1 3/16			
	15'9"	1 5/32		2'7"	1 21/32
	21'0"	1 3/32		5'3"	1 39/64
				7'10"	1 37/64
	2'7"	1 9/16		10'6"	1 17/32
	5'3"	1 17/32	8 B	13'1"	1 1/2
	7'10"	1 1/2		15'9"	1 29/64
	10'6"	1 15/32		18'4"	1 27/64
7 B	13'1"	1 13/32		21'0"	1 3/8
	15'9"	1 3/8			
	18'4"	1 11/32		2'	1 5/8
	21'0"	1 5/16		4'	1 9/16
				6'	1 17/32
	2'	1 3/8	8 C	8'	1 1/2
7 C	4'	1 11/32		10'	1 15/32
	6'	1 5/16		12'	1 13/32
				14'	1 3/8
	2'	1 3/8			
7 D	4'	1 9/16			
	6'	1 17/32			

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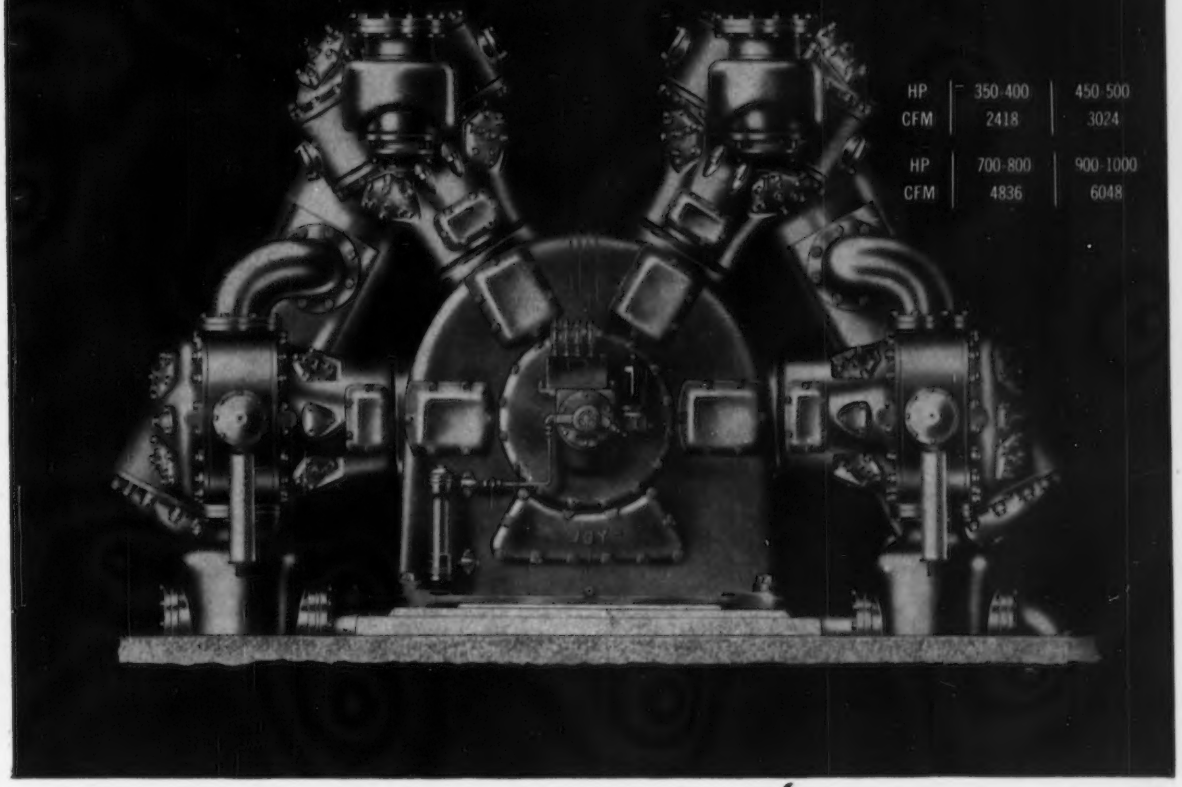

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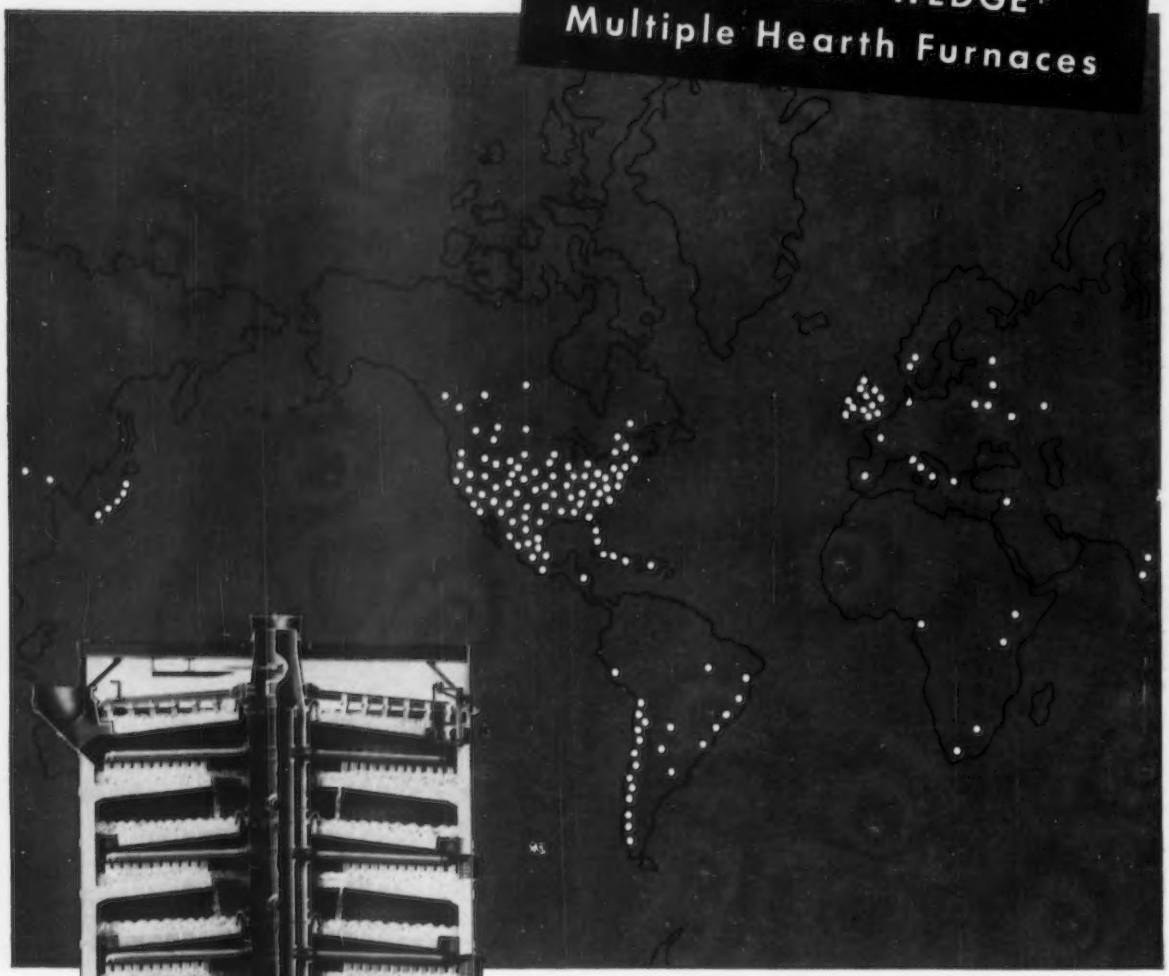

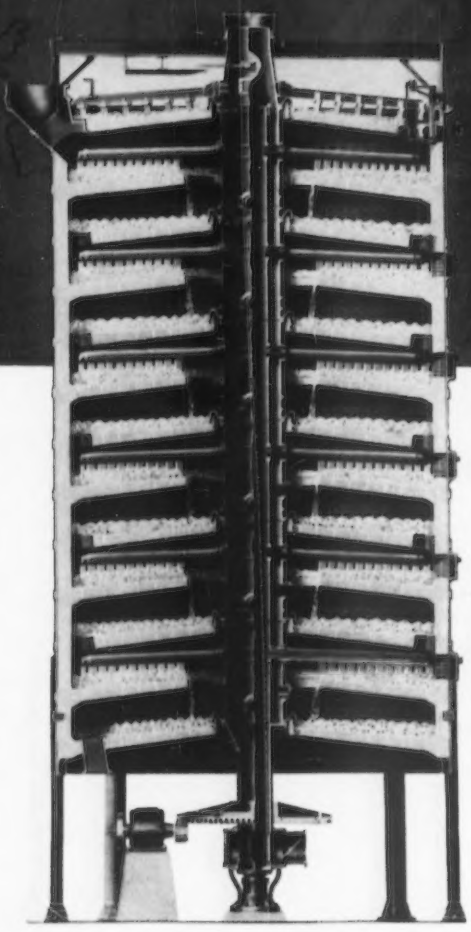

Each white dot on the map above represents from one to 20 Nichols Herreshoff or Bethlehem Wedge furnaces serving industry in this country and abroad.

These furnaces are treating materials ranging from **A**ctivated Carbon, through chemicals and ores to **Z**ircon Sand.

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Philippines *(Continued)*

Consolidated Mines has announced a contract for sale of 550,000 tons of Masinloc chromite fines to the Nanyo Bussan Co., Tokyo, Japan. Present stockpile of fines is estimated at 2-million tons.

Benguet Consolidated plans to expand its activities and expects to bring in additional mining engineers and geologists for its staff. Under regulations of the Philippine government, the men selected must have had at least 5 years, preferably 10 years experience before they can be allowed to enter the Philippines. Like other gold mining companies in U.S. and Canada, the Benguet Co. is diversifying its corporate interests and has a new company in Manila to engage in installment and merchandise inventory financing.

May production at Surigao Consolidated was valued at $212,700 at premium prices from 6900 tons of ore, averaging $31 per ton. Production includes 3327 oz gold, 3300 oz silver, and 268,200 lb lead.

Palawan Quicksilver Mines milled 4213 tons of cinnabar ore in May for a recovery of 22,156 pounds of mercury.

IN EUROPE

AUSTRIA

Output of raw graphite increased in 1956 to 18,685 metric tons over the 1955 yield of 17,814 metric tons. The 1956 production comprised foundry graphite at 16,247 metric tons (1955: 14,973 metric tons), electrode graphite at 1,521 metric tons (1955: 977 metric tons) and flotated graphite at 87 metric tons (1955: 86 metric tons. 1956 production increase thus amounts to 871 metric tons.

Exports during 1956 rose to 13,936 metric tons, as against 12,618 metric tons tabulated for 1955. The increase in export volume thus was 1,318 metric tons. Of the 1956 production, 74% was exported, as against roughly 70% during 1955.

Main customers during 1956 were: West Germany (9,420 metric tons), Italy (2,151 metric tons), Belgium (523 metric tons), Poland (497 metric tons), Switzerland (325 metric tons), Yugoslavia (285 metric tons), France (247 metric tons) and overseas countries 65 metric tons, mostly high-grade flotation graphite.

Two Austrian plants share in these achievements: the mines of Kaiserberg and Trieben.

Austria's second largest magnesite company, the "Astro-American Magnesite Co. of Radenthein," Carinthia, plans to increase steeply the 1957 mining level (over the preceding year's) by plunging into the 100,000 metric ton magnesite deposit that was discovered in early postwar years in Fieberbrunn (Salzburg Province). The company plans to employ between 250 and 300 miners.

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GREECE

Austro-American Magnesite Co. recently concluded a deal with the Greek government, outlining the mining of Greek magnesite by this company. Deposits in Vavdon (on the Chalkidike Peninsula in northern Greece) will be mined by a Greek corporation which is 100% owned by the Austrian firm. Capital worth $800,000 is to be brought into Greece, of which $150,000 worth will consist of machinery. Company is to mine and process magnesite for a period of 10 years, after which time all Greek installations will be taken over by Greek groups. Greek magnesite exceeds Austria's product in quality.

The Greek magnesite industry employs about 5,000 workers at this time. The Greek project was bitterly criticized both in Greece ("we have enough funds to finance this project by ourselves," say Greek economists) and in Austria ("Austrian-mined Greek magnesite can create such stiff competition for the Austrian product that the domestic Austrian chances will diminish").

GERMANY

East German mining company, Mansfelder Huettenkombinat, has reportedly started to operate a distillation plant for the production of 99.99% selenium. Raw selenium is extracted from roasted copper ores by electrolysis. Company also recovers selenium from roaster fly ash.

Mining of an iron ore deposit at Salzgitter-Gifhorn, Lower Saxony, supposedly the largest unexploited European deposit, will start before year end, according to Dr. H. Kolbe, chief geologist A. G. Fuer Berg-und Huettenbetriebe, Salzgitter. Deposit contains at least 2-billion tons at depths between 874 and 1312 yards.

Bayrische Braunkohlenindustrie, A. G. has discovered uranium in Schwandorf, in the Bavarian Forest mountains. The 100,000-ton deposit is brown coal, containing 200 to 4500 grams (about 10 lb) uranium per ton.

Earlier uranium finds in the Fichtelgebirge and Black Forest have been slightly disappointing as they contain only a few tons of uranium; most deposits are in North Hesse.

Further prospecting is being carried out jointly by Maxmilianshuette, A. G., Gewerkschaft Brunhilde, and the Bavarian fluorite industry. Government institutions are engaged in searching for uranium in Hanover, Wuerttemberg-Baden, and Rheinland-Pfals. Practically no prospecting is undertaken by individuals since the government concessions are granted only to "suitable applicants".

ITALY

Large deposits of potassium salts have been located in Sicily in the vicinity of Enna, Caltanisetta and Racalamuto in

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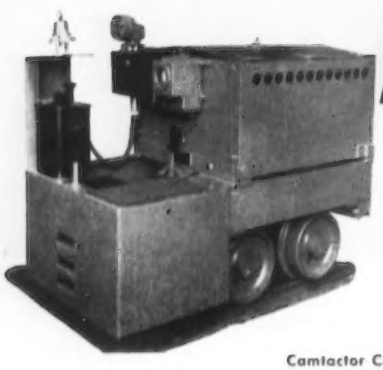

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Italy *(Continued)*

the course of an island-wide, three-year geologic and geophysical survey conducted principally to ascertain the location and extent of sulphur-bearing basins.

Survey, which is still in progress, was sponsored jointly by the Autonomous Region of Sicily and the Ente Zolfi Italiani, the central government's agency for coordinating scientific and commercial information and activities involving sulphur. It is expected to be completed soon and data obtained to date are being compiled and evaluated by Professor Giuseppe Aprile, University of Palermo geologist-engineer.

In addition to what are officially described as "imposing" deposits of potash in the regions indicated, survey teams have located 20 new sulphur basins with "commercial possibilities" in or near Santa Rosalia in the province of Aragona;

Professor Aprile stressed that the survey, extensive though it has been, is merely preliminary. No effort was made to arrive at quantitative estimates for either the potash or sulphur deposits.

CZECHOSLOVAKIA

The halting supply of Hungarian bauxite during the fourth quarter of 1956 caused the 1956 Czech aluminum production to remain below the 1955 level: Only 21,204 metric tons of Al metal were produced during 1956, as against an all-time high of 24,381 metric tons during 1955. Development of the Czech aluminum output in regard to electric power production is shown in the tabulation below. (Electric power consumption per metric ton of Al-metal has been taken at 17,500 kwh per metric tons of crude aluminum).

Year	Aluminum Output metric tons	Electric power (kwh) to aluminum industry
1953	2,735	47,862,500
1954	15,424	269,920,000
1955	24,381	426,675,000
1956	21,204	371,060,000

BULGARIA

Bulgaria's lead-zinc deposits, officially estimated to contain 35,000,000 metric tons of ore, have yielded 1,750,000 metric tons of lead-zinc ores during 1956. Development of a domestic processing industry—beyond the present small scale—is to yield 50,000 metric tons of lead and zinc by 1958.

Copper production last year amounted to 620,000 metric tons of copper ore. A processing unit, at present under construction, is to yield 10,000 metric tpy electrolyte copper after the plant starts operations at the end of the current year.

Both the lead-zinc and the copper output are far above the Bulgarian domestic requirements level. Whereas these metals have been exported exclusively to the fellow Soviet-satellite countries so far, sales to the West are desired from the end of 1957 on—these

Boom-mounted drills and wagon drills, equipped with 1¼-in. round Bethlehem Hollow Drill Steel, bite into rock at site of Bear Creek Dam, on Lehigh River in northeastern Pennsylvania. Supervising Authority: U. S. Army Corps of Engineers. Prime Contractor: Gasparini Excavating Co., Inc., Peckville, Pa. Drill Steel Reconditioner: Howells Mining Drill Company, Plymouth, Pa.

New Flood Control Project For Lehigh Valley

Shown here is part of the rock removal for the first phase of Bear Creek Dam and Reservoir, a huge flood control project under construction on the Lehigh River at its confluence with Bear Creek, near White Haven, Pa. The blast holes for the 125,000 cu yd of rock and earth excavation were made with Bethlehem Hollow Drill Steel.

The earthfill dam and reservoir, plans for which were accelerated by hurricane and flood damage in 1955, is being constructed under the supervision of the U. S. Army Corps of Engineers, Philadelphia District. It is designed to provide flood protection for Allentown and Bethlehem, as well as other communities along a 75-mile stretch of the river. Upon completion, the dam will be 234 ft high, and 3000 ft long. The reservoir will accommodate the water runoff from 288 sq mi of drainage area, and will have a capacity of 108,000 acre-feet.

Bethlehem Hollow Drill Steel is ideal for any type of rock removal because it is rolled from fatigue-resistant steel. Its hole is uniform, and centrally located. It has a wide quenching range. It is easy to heat-treat for the proper balance of toughness and wear-resistance, making possible long-wearing threads and strong shanks.

Bethlehem Hollow comes in Carbon and Ultra-Alloy grades in rounds, hexagons and quarter-octagons, in lengths of from 18 ft to 27 ft. Longer lengths can also be furnished.

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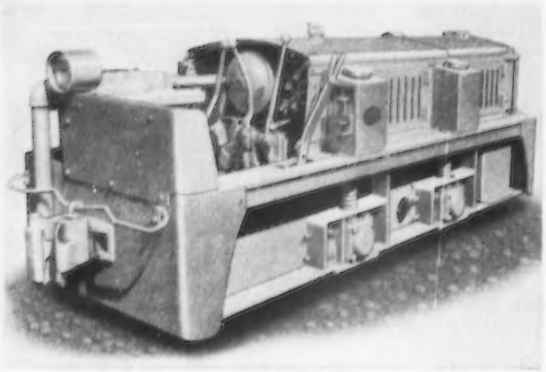

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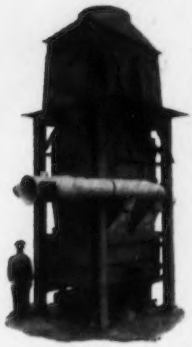

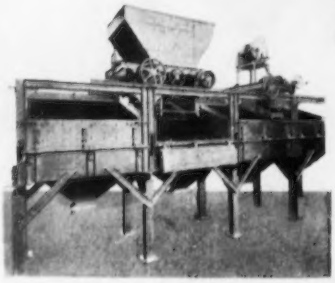

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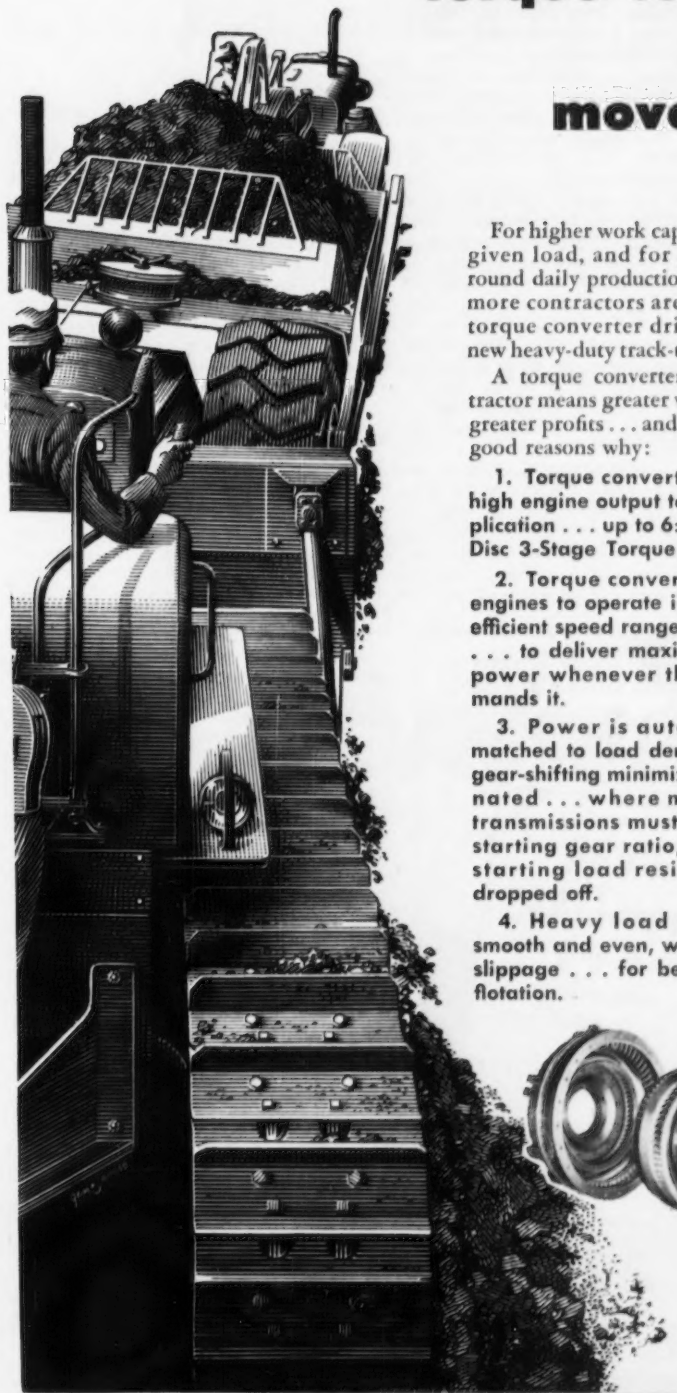

For higher work capacity on any given load, and for greater all-round daily production, more and more contractors are specifying torque converter drives in their new heavy-duty track-type tractors.

A torque converter drive in a tractor means greater work output, greater profits . . . and here are five good reasons why:

1. Torque converters provide high engine output torque multiplication . . . up to 6:1 with Twin Disc 3-Stage Torque Converters.

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4. Heavy load pick-up is smooth and even, without clutch slippage . . . for better over-all flotation.

5. An infinite variety of ratios is available to work with, permitting smooth, accurate control and delicate handling of loads when required.

Besides boosting production on the job, torque converter equipped machines offer another important advantage, too. The fluid connection between the engine and the machine's drive train cushions out destructive shocks and vibrations . . . meaning less wear and parts replacement . . . less downtime on major equipment investments.

Allis-Chalmers, Caterpillar and International Harvester all offer certain track-type tractor models equipped with torque converter drives, either as standard or as optional equipment. But, regardless of the model or whether the drive is standard or optional, the torque converter components will be furnished by Twin Disc Clutch Company. All three of the "big three" *standardize on Twin Disc for torque converter components.*

Be sure to specify a torque converter drive in your next track-type tractor . . . and watch your profits go up from then on in.

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Bulgaria *(Continued)*

sales ambitions spurred by the need to earn Western currency.

POLAND

A number of sulphur deposits have been found during 1956-1957 in Poland, totalling some 11-million metric tons of sulphur. Polish government has issued an order, whereupon exploitation is to start at once; the projected processing mills to total 500,000 metric tons in annual capacity. Two smaller plants are to produce sulphuric acid and sulphuric fertilizer (superphosphate).

Deposits are centered around Piaseczno (Kielce district), and Tarnobrzeg (Rzeszov district). The deposits lie under a cover measuring between 14 and 15 meters (35.29 to 35.91 ft) in depth. A temporary experimental open-pit mine was started there after the discovery of the deposit during July 1956. About 55,000 cubic meters of earth and some 5-million cu meters of water had to be removed before the first 10,000 metric tons of sulphur was gained from the small mining site.

Output at Tarnobrzeg and Piaseczno together is to reach 100,000 metric tons of pure sulphur in 1961, and a total of 500,000 metric tons per annum beginning from 1967. Local sulphuric acid factory is to produce 600,000 of acid, and the fertilizer plant more than 1-million metric tons of superphosphate fertilizer. Possible savings resulting from building up this center are illustrated by the fact that Poland would have to spend $26-million worth of foreign currency for payment on Polish sulphur imports by 1970. On the other hand, Poland will be able to export sulphur products worth $10-million by 1970, simultaneous with cutting imports to a negligible figure.

RUSSIA

Years of geological prospecting work have paid off near the mountain creed Urup in the Transcaucasian area a recent report aired over Radio Stavropol stated. "The Urup copper deposit is estimated to be one of the largest in the entire Soviet Union. Ore vein is ranging between 35 to 40 meters (114.82 to 131.23 ft) in width, the orebody has been surveyed over a distance of 35 kilometers (21.748 miles). Amount of copper contained in this vein—although not closely estimated at this time—is believed to yield raw material for several dozen of years.

"Ore as brought up from the 1,000-meter (3,280.80-ft) deep test holes showed that Urup copper ore is superior in ore concentration as compared to the Ural mountain deposits. In some places, ore contents ranging from 10 to 12% Cu have been found. In addition, the tests discovered gold, silver, zinc, cobalt and molybdenum. Also some sulphur has been located. Earlier findings in the Urup area have brought up deposits of rare metals—such as germanium—which will be mined soon."

IN ASIA

SOUTH KOREA

Changhang smelter, a major rehabilitation project of the UN Korean Reconstruction Agency (UNKRA), is now refining about 90 tons of copper a month, as well as half a ton of silver and a hundredweight (112 pounds) of gold.

When the final phase of modernization of metallurgical processes has been completed, the plant is expected to increase its production to 350 or 400 tons of copper a month, one ton of silver, and as much gold as can be found in the ores. Production of lead, now being extracted in small quantities, will be expanded to a minimum of 200 tons monthly.

UNKRA has allotted a total of $1,555,742 for rehabilitation and modernization of this plant. Four senior Korean technicians are being sent by UNKRA to study modern smelting and refining methods in the United States, Europe and Finland.

Between 70 and 80 Korean metal mines depend on the Changhang smelter for the handling of their products.

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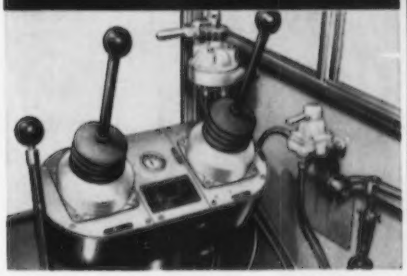

The newest of all shovel-crane power controls. "Metered Air" feeds power to clutches at any rate desired — yet operator retains full "feel" of all operations. Fewer levers, fewer motions, faster, smoother, less effort, less fatigue.

3.

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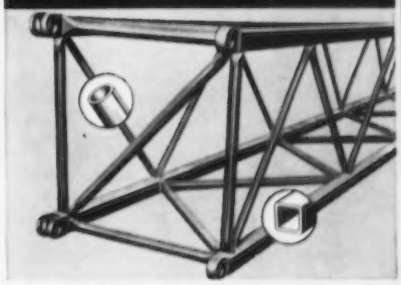

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☐ Are rollers distributed evenly to prevent "pulse" and vibration?

Roller Construction

☐ Are the rollers crowned for optimum load distribution?

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Nickel Forecast

(*Continued from p 89*)

time consumption possibly has not always been equated with demand. Particularly in the last third of the 45 years, when nickel was frequently in short supply, there are evidences of the metal being displaced from four major markets as follows:

Low-alloy steels	15,750 tons
Stainless steels	12,000 tons
Nonferrous alloys	10,600 tons
Electroplating	8,650 tons
Total	47,000 tons

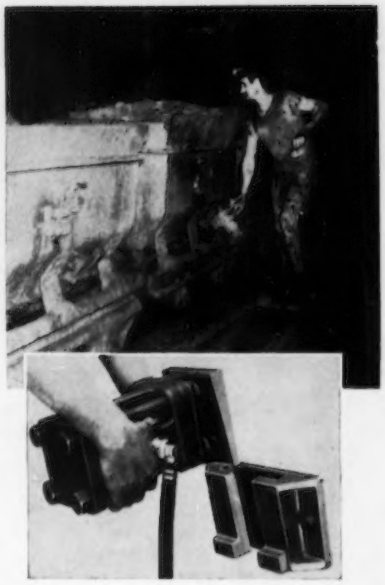
Thus the 1955 usage of 111,500 tons actually might have been 47,000 tons larger, or 158,500 tons, had there been that much nickel available then. To adjust the formula to this figure from its 1955 basis of 126,400 tons requires an allowance of approximately 32,000 extra tons of nickel demand.

Secondly, normal growth must be allowed for. In steel, this might mean 142-million tons in 1965; and at 9%, an alloy-steel output of 12.8-million tons—equal to a basic nickel requirement of 60,000 tons. In other industries, this might mean a durable-goods output index of 173½ in 1965—equal to a basic nickel need of 88,000 tons. Normal growth would require 148,000 tons of nickel in 1965. Allowing for recapture of markets lost recently would swell this to 180,000 tons.

Thirdly, making a 1956 adjustment for increased trends to super alloys within the stainless-steel industry adds another 5,000 tons. In 1956 there were about 12,700 tons of nickel used in these super alloys, and possibly another 11,300 tons of nickel were used in nonferrous super alloys—although there may be overlapping in the two categories. With military needs liable to quadruple, a further 36,000 tons of nickel may be required for super alloys, or a total adjustment of 41,000 tons for this purpose. This would make the total 221,000 tons, or about the level of the ODM expansion goal.

Lastly, should there be a gas-turbine powered automobile on the way, due to arrive in 1965, and using 4 lb of nickel (in 20 lb of super-alloy stainless steel), this could mean 10-million vehicles and a further 20,000 tons demand, or 241,000 tons all told.

With stockpiling operations dwindling, and the supply picture looking much better, indications now are that the supply of nickel will be augmented progressively to about the foregoing level by 1965, making it reasonable to add the foregoing adjustments to the basic formula projections of nickel demand—assuming no war and no depression.



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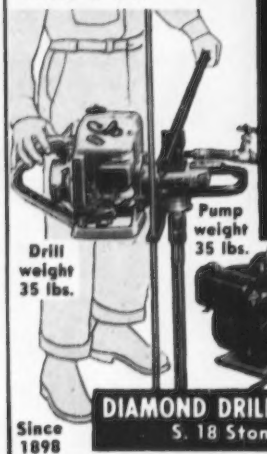

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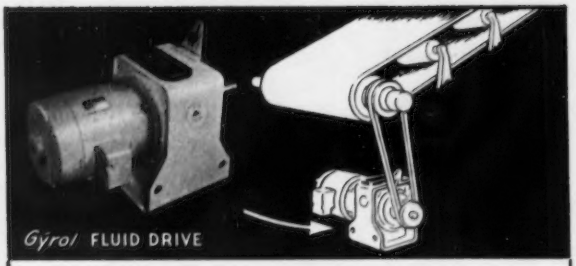

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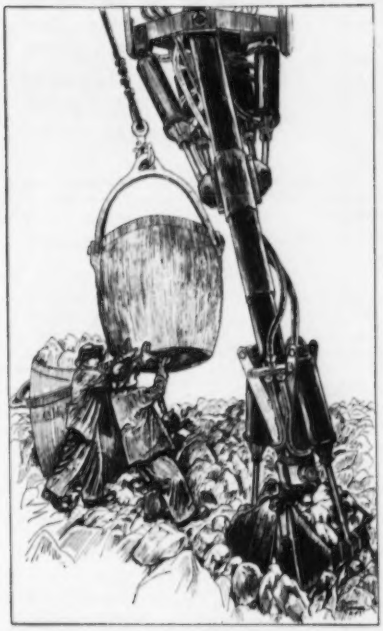

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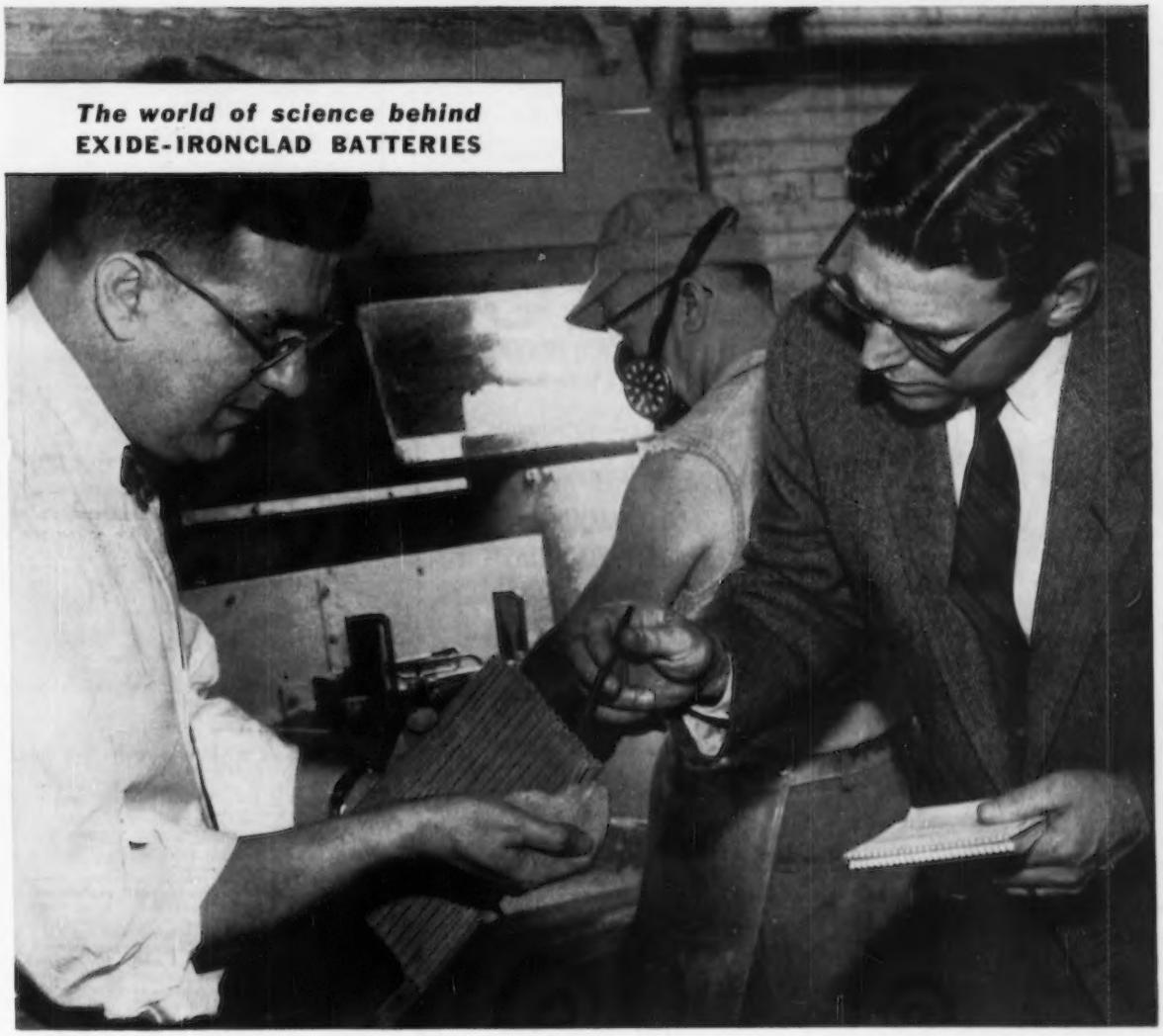

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Wagner: Absolutely. We can use the more active oxides that give the batteries higher capacity.

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Wagner: It isn't likely. First, this blend is the result of more than 40 years of Exide research—and it's an Exide exclusive. Second, we can use it successfully because of the unique tubular construction of the Exide-Ironclad positive plate.

Reporter: How does tubular construction help make it a better battery?

Wagner: Because the cylindrical power tubes hold the tiny oxide particles firmly in electrical contact clear through the charge and discharge cycle. So Exide-Ironclad Batteries can maintain their high capacity—even under severe vibration—for years of service.

Reporter: Obviously, this is an important feature of Exide-Ironclad Batteries.

Wagner: Yes it is, but it's just one of many engineering details that contribute to its high capacity and long life.

Note to battery users. Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Phila. 2, Pa.

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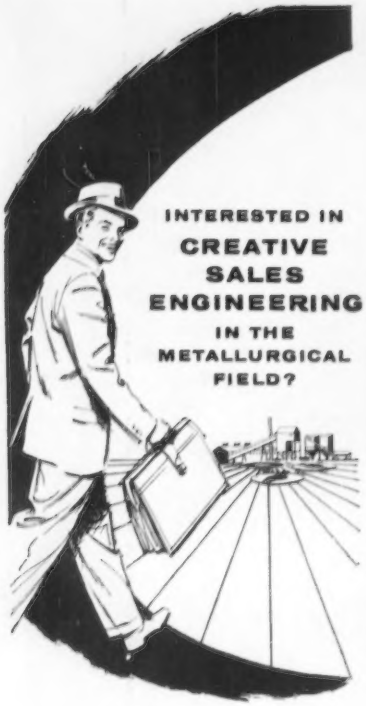

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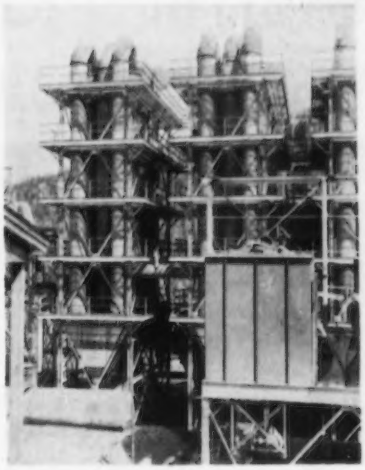

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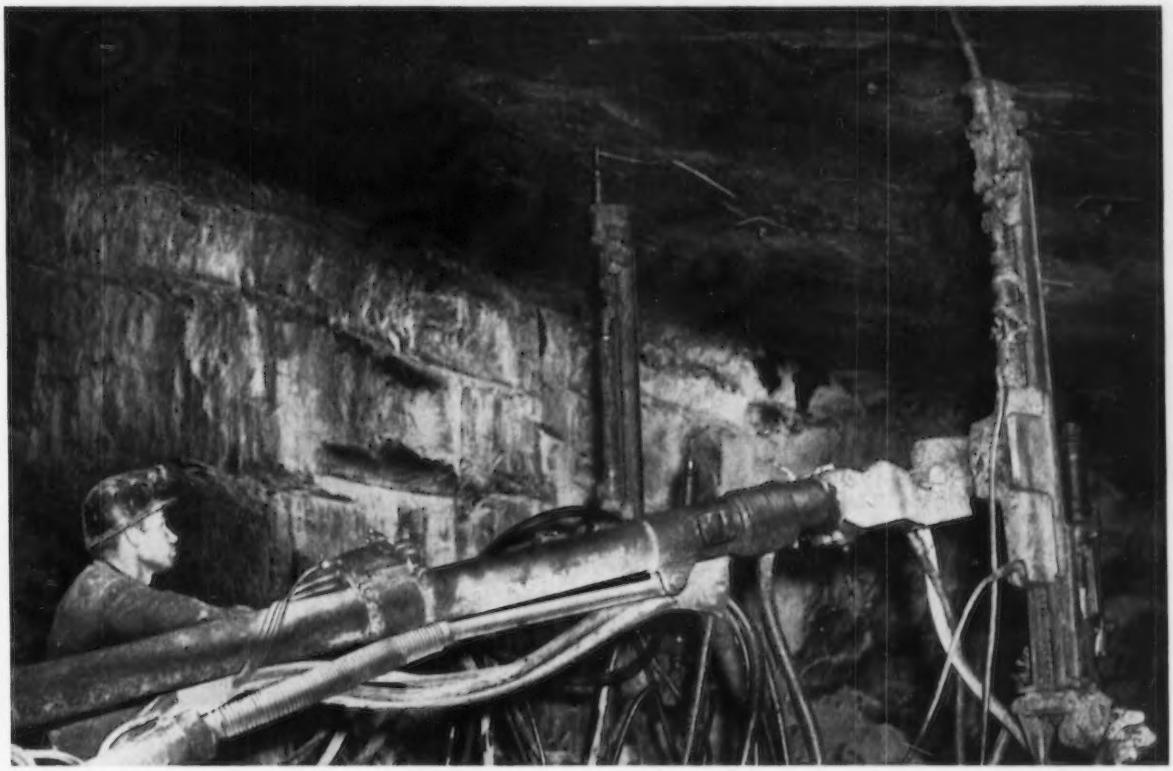
ENGINEER'S FIELD REPORT

LUBRICANT CHEVRON* VISTAC OIL

LOCATION A COAL MINE IN UTAH

Chevron* Vistac Oil protects mine roof bolters operating in water and heavy abrasive dust



WORKING CONSTANTLY in heavy abrasive dust, high humidity and water in one of Utah's largest coal mines, these Joy roof bolters are lubricated with Chevron* Vistac Oil. To eliminate crossbar timbering and provide greater safety and increased production, these air tools drill holes, hammer bolts and tighten nuts on steel bearing plates. Bolts up to 8 feet long are rammed in to refusal at pressures up to 3,000 lbs. psi.

The master mechanic for underground operations at the mine reports: "Vistac Oil has proved completely satisfactory for this tough service. It continues to lubricate and protect these machines even under our most difficult dust and water conditions." Chevron Vistac Oil is also used in all other air equipment in the mine.

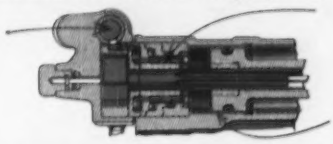
For More Information about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

* The Chevron Brand covers the line of industrial products formerly sold under the Calol name. This is a name change only. The high quality and specifications remain the same.

CHEVRON Industrial Lubricants

TRADEMARK "CHEVRON," "VISTAC" AND DESIGN REG. U.S. PAT. OFF.

Why Chevron* Vistac Oil cuts costs in air-tool equipment



- Atomizes quickly and completely—carries evenly over all parts. Prevents excessive fogging and has no unpleasant odor.
- Additives help form tenacious, oily, pressure-resistant film in wet or dry conditions—cuts wear and power loss. Small quantity lubricates efficiently.
- Resists high temperatures and oxidation. Stays fluid at low temperatures.

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On this stripping operation

CAT* DW21-NO. 470 RIGS ARE DELIVERING LOW-COST PRODUCTION

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The picture above shows one of the firm's seven big DW21s with No. 470 LOWBOWL Scrapers being push-loaded by a D9 Tractor. And it shows something else, too—how to move material at the lowest cost per yard.

These DW21-No. 470 rigs have capacities for big-volume hauling—18 cu. yd. struck, 25 cu. yd. heaped. But more important than capacity, the No. 470's LOWBOWL design has greater loading efficiency than *any other make* of scraper in its class. Actual tests show that the No. 470 gets its rated capacity load and is on its way while other scrapers are still in the cut struggling for the last few yards.

And when it has its big load, the DW21 moves it at high speeds, efficiently. Its 300 HP (maximum output) Cat-built Engine has a Turbocharger to add horsepower at reduced fuel costs. Air is packed into the engine *according to engine load*, not speed. Wide-section, tubeless, 29.5-29 tires provide excellent flotation and furnish greater tractive effort.

Let your Caterpillar Dealer show you how these rugged rigs can move material faster and cut costs on your operation. You can depend on him for sound advice now—for fast service and parts you can trust after you buy.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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This increase in capacity ratings makes it possible for many of you to use smaller bearings. Your products can be made more compact. You can save weight. You may be able to reduce the size of your shafts and housings. And you may be able to use Timken bearings in new applications where they have not been practicable in the past.

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Third, a careful review of the life of millions of Timken bearings in the field.

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To find out how the new capacity ratings affect the types and sizes of Timken bearings in which you are interested, call your Timken bearing representative or write our Engineering Department. We'll be glad to work with you at the drawing board stage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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